

# **Proceedings**

*from the*

**1998 NASA  
Occupational Health Conference**

## ***Benchmarking for Excellence***

*August 24 - 28, 1998*

**Orlando, Florida**

*Prepared for*

***The National Aeronautics and Space Administration  
Office of the Manager, NASA Occupational Health Program  
John F. Kennedy Space Center, Florida***

*by*

***The Bionetics Corporation  
Mail Code BIO-5  
Kennedy Space Center, Florida 32899***

***Under Contract S-NAS10-001  
to the  
Dynamac Corporation***



# Proceedings

*from the*

*1998 NASA Occupational Health Conference*

## *Benchmarking for Excellence*

*August 24 - 28, 1998*

**Orlando, Florida**

<b>Welcome and Opening Remarks</b>	<b>1</b>
<b>Plenary Sessions</b>	<b>3</b>
<b>Keynote Address</b>	<b>92</b>
<b>Breakout Sessions</b>	<b>94</b>
<b>Poster Presentations</b>	<b>127</b>
<b>Poster Awards</b>	<b>203</b>
<b>Continuing Education</b>	<b>204</b>
<b>Center Director's Tour of KSC</b>	<b>206</b>
<b>Pre-conference Professional Development Course</b>	<b>208</b>
<b>Welcome Reception</b>	<b>226</b>
<b>Conference Participants</b>	<b>230</b>

# Contents

## **WELCOME AND OPENING REMARKS 1**

Chair: **Irene D. Long, MD, MS**  
Director, Biomedical Office, Kennedy Space Center

**Roy D. Bridges, Jr.**  
Director, Kennedy Space Center

**Arnauld E. T. Nicogossian, MD, MS**  
Associate Administrator, NASA Office of Life and Microgravity Sciences  
and Applications, Washington, DC

## **PLENARY SESSIONS**

### **SESSION I Benchmarking Defined 3**

Session Chair: **Alan G. Gettleman, MBA**  
Coordinator, NASA Occupational Health Program  
Kennedy Space Center

#### **Benchmarking: Workplace Trends and Current Issues in Occupational Health 4**

**Brenda R. Blair, MBA, CEAP**  
Blair & Burke, College Station, Texas

### **SESSION II Benchmarking Practices 18**

Session Chair: **G. Wyckliffe Hoffler, MD**  
Conference Technical Coordinator  
The Bionetics Corporation, Kennedy Space Center

#### **Results Oriented Benchmarking: The Evolution of Benchmarking at NASA from Competitive Comparisons to World Class Space Partnerships 20**

**Michael A. Bell, MS**  
Manager, Benchmarking and Metrics, Business Innovation Group  
Kennedy Space Center

<b>Benchmarking the Federal Agencies</b>	<b>24</b>
<p><b>Emmett B. Ferguson, Jr., MD, MPH</b>  Manager, Occupational Health Program Support Office  The Bionetics Corporation, Kennedy Space Center</p>	
<b>Technological Advances in Travel Medicine</b>	<b>31</b>
<p><b>David K. McKenas, MD, MPH</b>  Corporate Medical Director, American Airlines, AMR Corporation</p>	
<b>International Travel Health Considerations</b>	<b>40</b>
<p><b>Robert L. Weston, MD</b>  President, International Healthcare Division, International SOS  Assistance, Inc.</p>	
<b>SESSION III    Benchmarking Realities</b>	<b>44</b>
<p>Session Chair: <b>Steven G. Brisbin, MS</b>  Senior Environmental Health Officer, NASA Occupational  Health Program Office, Kennedy Space Center</p>	
<b>International Space Station Overview</b>	<b>46</b>
<p><b>William V. Bates, Jr., BS</b>  Chief of Staff, Space Station Program Office, Johnson Space Center</p>	
<b>Direct Sampling Ion Trap Mass Spectrometry—A New Tool for Environmental Monitoring</b>	<b>51</b>
<p><b>Peter T. Palmer, PhD</b>  Department of Chemistry and Biochemistry, San Francisco  State University</p>	
<b>U. S. Postal Service Safety and Risk Management Overview</b>	<b>54</b>
<p><b>Jerry A. Jones, WSO, CSE, CSM</b>  Manager, Risk Management, U. S. Postal Service Headquarters,  Washington, DC</p>	

<b>Developing Normative and Benchmark Data For Health and Productivity Management: Results of a Multi-Employer Benchmarking Study</b>	<b>57</b>
<b>Ron Z. Goetzel, PhD</b> Vice President and Director of Health and Productivity Management, The MEDSTAT Group, Washington, DC	
<b>SESSION IV    Benchmarking Unlimited</b>	<b>65</b>
Session Chair: <b>Emmett B. Ferguson, Jr., MD, MPH</b> Manager, NASA Occupational Health Program Support Office The Bionetics Corporation, Kennedy Space Center	
<b>Johnson &amp; Johnson: Benchmarking for Excellence, Corporate Health Achievement Award Winner</b>	<b>67</b>
<b>Susan L. Lemons, MS, MBA</b> Vice President, Quality Management and Reengineering, Johnson & Johnson	
<b>Fikry W. Isaac, MD</b> Director, Occupational Medicine, Health & Wellness, Johnson & Johnson	
<b>An Integrated Shared Services Model</b>	<b>73</b>
<b>Fikry W. Isaac, MD</b> Director, Occupational Medicine, Health & Wellness, Johnson & Johnson	
<b>Excellence Through Communications—Clear Oral Presentations</b>	<b>81</b>
<b>Marilynn E. Bell, Doctorate in English</b> Wordsmiths Training and Consulting	
<b>Excellence Through Communications—Clear Technical Writing</b>	<b>85</b>
<b>Marilynn E. Bell, Doctorate in English</b> Wordsmiths Training and Consulting	
<b>KEYNOTE ADDRESS</b>	<b>92</b>
<b>Medical Aspects of Space Walking</b>	
<b>Story Musgrave, MD</b> NASA Astronaut, Retired	

<b>BREAKOUT SESSIONS</b>	<b>94</b>
<b>SESSION I Physicians, Industrial Hygienists, and Contracting Officer's Technical Representatives</b>	
Co-Chairs: Steven G. Brisbin, MS; Emmett B. Ferguson, Jr., MD Kennedy Space Center	
<b>NASA Occupational Health Program FY98 Self Assessment</b>	<b>96</b>
Steven G. Brisbin, MS	
<b>Occupational Health Program Performance Measures (Metrics)</b>	<b>98</b>
Emmett B. Ferguson, Jr., MD	
<b>Essential Components of the Occupational Medicine Program</b>	<b>102</b>
Emmett B. Ferguson, Jr., MD	
<b>Physical Examination Nomenclature and Standardization</b>	<b>105</b>
Emmett B. Ferguson, Jr., MD	
<b>SESSION II Employee Assistance Program Counselors</b>	
Co-Chairs: Alan G. Gettleman, MBA; William T. McGuire, MA, CEAP, Kennedy Space Center	
<b>Employee Assistance Program Issues</b>	<b>109</b>
Alan G. Gettleman, MBA, William T. McGuire, MA CEAP	
<b>SESSION III Nurses</b>	
Chair: Claire R. Sleboda, RN, BSN, COHN-S, Dryden Flight Research Center	
<b>Benchmarking for Excellence and the Nursing Process</b>	<b>110</b>
Claire R. Sleboda, RN, BSN, COHN-S	
<b>SESSION IV Physicians, Nurses, and Exercise/Fitness Professionals</b>	
Chair: Emmett B. Ferguson, Jr., MD, Kennedy Space Center	
<b>NASA Occupational Health Procedures and Guidelines on Health Services for International Travel or Assignment</b>	<b>112</b>
Emmett B. Ferguson, Jr., MD	
<b>RehabWorks at the Kennedy Space Center</b>	<b>118</b>
Mary K. Kirkland, ATC/L, CSCS	

<b>Health Risk Appraisal and Health Education Programs</b> Emmett B. Ferguson, Jr., MD	<b>122</b>
<b>Kennedy Space Center Coronary Heart Disease Risk Screening Program</b> David A. Tipton, MD, MS and Philip J. Scarpa, MD, MS	<b>124</b>
<b>SESSION V Industrial Hygienists</b>	
Chair: Steven G. Brisbin, MS, Kennedy Space Center	
<b>Industrial Hygiene Issues</b>	<b>125</b>
<b>POSTER PRESENTATIONS</b>	
<b>SSC Environmental Health Project Program</b> Denise C. Brever, CIH, Johnson Controls, Inc., Stennis Space Center	<b>128</b>
<b>MSFC Respiratory Protection Services</b> James P. CoVan, Marshall Space Flight Center	<b>133</b>
<b>Self-Disclosure as a Predictor of EAP Supervisory Utilization</b> Timothy L. Donohoe, MS, LPC, Stennis Space Center; James T. Johnson, PhD and Joanne Stevens, EdD, University of Southern Mississippi; Maurice A. Taquino, MD, Stennis Space Center	<b>136</b>
<b>Predicting Return to Work in Patients with Coronary Heart Disease</b> M. Rony Francois, MD, MSPH and Patricia David, MD, University of South Florida	<b>139</b>
<b>A Follow-up Study of Ergonomic Evaluations Performed at KSC/CCAS in 1997</b> Bart Geyer, EG&G Florida, Inc., Kennedy Space Center	<b>144</b>
<b>ISO Excellence at JSC</b> Sheilla Goldberg, MS and Rebecca Siemens, MS, Kelsey-Sebold Clinic, Johnson Space Center	<b>148</b>
<b>Lead Poisoning in a Construction Company: Science Effecting Policy</b> T.R. Hales, C. McCammon, W. Daniels, S. Lee, NIOSH, Cincinnati, OH	<b>153</b>
<b>The Nurse Practitioner in NASA Occupational and Preventive Medicine Programs</b> Janet Kiessling, COHN-S, MSN, CRNP, Kelsey-Sebold Clinic, Marshall Space Flight Center	<b>156</b>

<b>Potential Impact of Local Fauna on Employees at the Kennedy Space Center</b>	<b>158</b>
George A. Martin, MD, Biomedical Office; Arthur A. Arnold, Jr., MD, The Bionetics Corporation, Kennedy Space Center	
<b>A Comparison of the Effects of Various Exercise Programs on Reduction of Body Fat</b>	<b>159</b>
Cristy L Mathews, MS, CSCS, HFI; Chris A. Symons, BS, CSCS; Arthur A. Arnold, MD; Dan Woodard, MD; Marion P. Merz, MT, ASCP; Barbara Deppensmith, MT, ASCP; Deborah Ghiotto, RN, NP; Cathy DiBiase, RN, BSN, The Bionetics Corporation, Kennedy Space Center	
<b>Chemical Hygiene Program</b>	<b>164</b>
Antoinette C. Mayor, Lewis Research Center	
<b>The Employee Assistance Program and the Workplace Violence Working Group: “Benchmarking in Tierra Incognita”</b>	<b>165</b>
William T. McGuire, MA, CEAP, EG&G Florida, Inc., Kennedy Space Center	
<b>The Effectiveness of an On-site Musculoskeletal Rehabilitation Program at the Kennedy Space Center</b>	<b>166</b>
Erik T. Nason, MS, ATC/L, EMT/B, The Bionetics Corporation, Kennedy Space Center	
<b>Health Physics Innovations Developed During Cassini for Future Space Applications</b>	<b>170</b>
Rodney E. Nickell, Theresa M. Rutherford, EG&G Florida, Inc.; George M. Mamaro, Biomedical Office, Kennedy Space Center	
<b>Rebuilding the JSC Employee Assistance Program</b>	<b>178</b>
Jacqueline E. Reese, MA, LPC, Kelsey Sebold, Johnson Space Center	
<b>Johnson Space Center Safety and Total Health Day</b>	<b>180</b>
Janelle Reinoso and Sheilla Goldberg, MS, Kelsey-Sebold, Johnson Space Center	
<b>Evaluation of Cardiovascular Screening Retest for High Risk Employees – Update</b>	<b>182</b>
Carol A. Roth, RN, MSN, EG&G Florida, Inc., Kennedy Space Center	
<b>The Need to Reevaluate Nonresponding Ergometric Patients</b>	<b>186</b>
Philip J. Scarpa, MD, MS, Biomedical Office, Kennedy Space Center; Steven A. Field, MD, University of South Florida	
<b>Profile of Ambulance Runs at the Kennedy Space Center</b>	<b>188</b>
Philip J. Scarpa, MD, MS, Biomedical Office, Kennedy Space Center	

<b>Identification and Prioritization of Work Place Processes with Physical and Chemical Hazards at Kennedy Space Center and Cape Canaveral Air Station</b>	<b>191</b>
John D. Sherwood, EG&G Florida, Inc., Kennedy Space Center	
<b>Kennedy Space Center Coronary Heart Disease Risk Screening Program</b>	<b>195</b>
David A. Tipton, MD, MS and Philip J. Scarpa, MD, MS, Biomedical Office, Kennedy Space Center	
<b>Monitoring and Modeling Astronaut Occupational Radiation Exposures in Space – Recent Advances</b>	<b>200</b>
Mark Weyland, Lockheed Martin and Michael Golightly, Johnson Space Center	
<b>Online Hazard Communication</b>	<b>201</b>
Daniel Woodard, MD, The Bionetics Corporation, Kennedy Space Center	
<b>POSTER AWARDS</b>	<b>203</b>
<b>CONTINUING EDUCATION</b>	<b>204</b>
<b>CENTER DIRECTOR’S TOUR OF KSC</b>	<b>206</b>
<b>PRE-CONFERENCE PROFESSIONAL DEVELOPMENT COURSE</b>	<b>208</b>
Course Chair: <b>Steven G. Brisbin, MS</b> Senior Environmental Health Officer Kennedy Space Center	
<b>SESSION I Toxicology and Health-Based Risk Assessment: Applications in the Workplace</b>	<b>209</b>
<b>Christopher M. Teaf, PhD</b> Center for Biomedical & Toxicological Research, Florida State University	
<b>SESSION II Resolution of Indoor Air Quality Problems: The Human Factor</b>	<b>214</b>
<b>Sharon J. Bessa, CIH, COHN-S</b> Sharon J. Bessa & Associates, Inc.	
<b>WELCOME RECEPTION</b>	<b>226</b>
<b>CONFERENCE PARTICIPANTS</b>	<b>230</b>

## FOREWORD

The National Aeronautics and Space Administration (NASA) held this second Occupational Health Conference, since transfer of the Occupational Health Program Office to the Kennedy Space Center (KSC), in Orlando, Florida. This conference annually provides opportunity for personnel of the multiple disciplines involved in the practice of occupational health at all NASA Centers to exchange scientific and technical data and management experiences. They hear from experts in their own and related fields and share mutual and unique problems and solutions relevant to the health of the Agency's worker force. This forum brings Agency managers, scientists, and technicians to a common focus on their prior accomplishments and future plans with benefits to individuals, NASA Centers, and the overall Program.

NASA continues to address its occupational health concerns through firmly established concepts of preventative medicine in everyday work practices and processes. These concepts are essential in an agency with such diverse and hazardous work settings at its NASA Centers. However, the NASA Occupational Health Conference gives a convergent, integrative, and holistic view to the many aspects of occupational health. This year's Conference theme, Benchmarking for Excellence, set the stage for this approach.

To achieve this conference objective, guest speakers addressed cogent, relevant discipline topics, participants held workshops on important and forcing questions, and special sessions allowed deliberation of "in house" subject matters. The Conference provided opportunities for interchange of information within and among the several specialties representing Occupational Medicine and Environmental Health at each NASA Center. A pre-conference development course on toxicology enhanced the Conference agenda. Poster presentations, inaugurated last year for technical communications from the NASA Centers, were continued. An awards luncheon, complementary social features, and a tour of the host KSC rounded out the Conference.

All these events contributed to another excellent Conference from which participants could materially profit. The *Proceedings* archives the substance of the Conference.

It was my distinct privilege and pleasure to participate in this meeting. I also was privileged to introduce in attendance at the Conference the now confirmed new Manager of the NASA Occupational Health Program Office, Dr. William S. Barry, who took the reins of the Program Office at KSC in October 1998.

Irene D. Long, MD  
Acting Manager, NASA Occupational Health Program Office



## WELCOME AND OPENING REMARKS

Chair: **Irene D. Long, MD**  
Acting Manager, NASA Occupational Health Program Office  
Kennedy Space Center

The theme of the 1998 NASA Occupational Health Conference was "Benchmarking for Excellence." It was organized and managed by the staffs of the Biomedical Office and the Occupational Health Program Office at Kennedy Space Center (KSC) with assistance from support contractors. The Conference was held in the Buena Vista Resort & Spa in the Disney World Village (Orlando, Florida) and hosted by KSC. Many speakers and experts contributed to the Conference agenda by giving relevant presentations to participants representing the NASA Centers. This year a pre-conference professional development course on toxicology was offered to approximately 77 participants. Several dignitaries gave welcoming and opening remarks before the first plenary session.

**Dr. Irene D. Long**, Director of the Biomedical Office and Acting Manager of the Occupational Health Program Office at KSC, officially opened the Conference with comments about its design and purpose. She noted that management of the Program Office at KSC, in concert with the Biomedical Office, had currently assumed a more routine operational stance. A whole new thrust for the Program was now underway with the imminent installation of the newly selected Program Manager. After offering her own warm welcome, she introduced each of the other participants in the ceremonies.



**Mr. Roy D. Bridges, Jr.**, Director of the Kennedy Space Center, also welcomed Conference participants, pledging his full support to the KSC lead center role in managing the Occupational Health Program for the Agency. He noted the unique role of the KSC as the nation's primary spaceport and stressed the overarching axioms of safety and health first. He emphasized that safe thinking equates to safe working and that good choices equate to healthy life style. He challenged all to achieve even greater safety and health for our space workers.



**Dr. Arnauld E. T. Nicogossian**, Associate Administrator, Office of Life and Microgravity Sciences and Applications (OLMSA), NASA Headquarters, concluded the opening ceremonies with both a welcome and an overview of NASA Life Sciences programs. This was done in the spirit of increasing cooperation between the space medicine and occupational medicine elements within the Life Sciences organization. His overview described the present goals of the Human Exploration and Development of Space: 1) exploration of the effects of gravity on earth processes, 2) opening and development of the space frontier, 3) conduct of human missions, and 4) investment from the private sector.



Dr. Nicogossian gave a brief review of the programs and functions of the OLMSA and support by NASA Centers and commercial space centers. He showed how these all tie into an integrated thrust for human exploration of space, achievements attained, and the inevitable returns therefrom for the improvement of life on earth. This has been especially true in the arenas of biomedical research, medical care, and development of biotechnologies. He also further underscored the alliance of health and safety, indicating that NASA is seeking Voluntary Protection Program status, not yet attained by any Federal agency. Space and occupational medicine likewise have much common turf, and they must join their capabilities to reach the goals of space exploration to which they owe their existence.

Upon conclusion of the formal welcomes and ceremonies, Dr. Long turned the moderation of the scientific program sessions of the Conference over to individual session chairs, who introduced invited guest speakers and in-house presenters. The session chairs also coordinated schedules, instructed participants in procedures, attended to logistics, and generally assured the smooth and timely flow of events.

## PLENARY SESSIONS

Thirteen invited guest speakers gave presentations on topics that contributed to the Conference theme of Benchmarking for Excellence. Two speakers presented results of recent benchmarking studies of Federal agencies and private companies. Another speaker delivered the luncheon keynote address on medical aspects of working in space.

### SESSION I **Benchmarking Defined**

Session Chair: **Alan B. Gettleman, MBA**  
Coordinator, NASA Occupational Health Programs  
Kennedy Space Center



Guest Speaker **Brenda R. Blair, MBA, CEAP**  
Blair & Burke  
College Station, Texas



**Benchmarking: Workplace Trends and  
Current Issues in Occupational Health**

# **Benchmarking: Workplace Trends and Current Issues in Occupational Health**

**Brenda R. Blair, MBA, CEAP**  
Blair & Burke

## **Introduction**

Occupational health services, like similar employer-provided services in the workplace, must assist in improving employee health and well being while at the same time enhancing productivity. This dual mission requires that Occupational Health Departments adopt continuous quality improvement systems just like any other function within the organization. It thus requires internal analysis, periodic benchmarking against other organizations, and constant monitoring of trends in the larger society which affect the delivery of occupational health services. The purpose of this presentation is fourfold.

- to present an overview of benchmarking, including definitions, objectives and methods
- to discuss trends in the workplace which affect the delivery of occupational health services
- to identify trends in healthcare delivery in the US which affect the delivery of occupational health services
- to identify and discuss trends in occupational health care in the US today

## **Benchmarking**

### **Benchmarking Definitions and Criteria**

The original meaning of benchmark was “a predefined position, used as a reference point for taking measures against.” Literally, this was often a mark on a bench, used to delineate the standard length of cloth or other material. Today this definition has evolved into a much broader concept.

The American Productivity and Quality Council uses the following definition:

A benchmark is a measured “best-in-class” achievement recognized as the standard of excellence for that business practice. **Benchmarking** is the practice of being humble enough to admit that someone else is better at something, and being wise enough to learn how to match and even surpass that person or company.

Thus, the essence of benchmarking involves moving from where you are to where you want to be and searching for best practices. **Benchmarking** is a process for identifying and importing **best practices** to improve **performance**.

In a certain sense, anything better than what you do now is an improvement. But a true search for best practices involves meeting certain criteria. What actually constitutes a best practice? How can you tell if something is a tested best practice and not just a “quick fix” which may not really work? The following criteria are recommended. A best practice is:

- successful over time
- measurable with quantifiable results
- innovative
- repeatable
- recognized positive outcome

Ideally, a best practice is one with a track record that can be measured, but in some instances, especially in health care, measuring outcome can be difficult. Thus, the criteria include the recognition of positive outcome, even if it can not be fully quantifiable. In searching for a best practice, it is suggested to try to meet as many of the above criteria as possible.

### **Types of Benchmarking**

There are several types of benchmarking, each of which serves a different objective and can help gather different information.

Internal - In internal benchmarking, you compare your processes with other departments of your own organization. Many organizations have found great improvements simply by identifying the best practices already in use within some part of their organization. However, internal benchmarking does not offer exposure to outside innovations.

Competitive - In this type of benchmarking, you compare your processes with those of your competitors. This can be very interesting, but very difficult to do. There may be legal restrictions on comparing processes and your competitors may be unwilling to share proprietary information.

Non-competitive - With non-competitive benchmarking, you seek out comparisons from related or unrelated industries that may nevertheless contribute ideas to your process improvement goals. For example, if the concern is customer service, information could be sought from a wide variety of industries that have a customer service component.

World class - In this approach, you compare your processes to the recognized leader. Certain organizations are known leaders in certain areas; much can be learned by going directly to them to find their best processes.

### **Benchmarking Steps**

Every author on benchmarking has different, but similar, steps in the benchmarking process. What follows is a distillation from several authors. References are located at the end of the article.

1. Identify what to benchmark. Define the scope of the project.
2. Understand your own process, including measurements.
3. Select benchmarking partners.
4. Gather data.
5. Analyze the data; identify gaps between your processes and “the best.”
6. Make recommendations for process improvements; sell the plan; implement.
7. Continue to monitor and improve.

Let us consider each of the steps individually.

1. Identify what to benchmark. Define the scope of the project.

First, it is necessary to select a process that is important. If the process has no financial or intrinsic value to the organization, it is not worth the effort which benchmarking requires. Next, choose something that you know you need to improve. It may be nice to choose something you already know you do well, in order to “prove” to upper management that you excel, but that is really not the purpose of benchmarking.

Next, identify project boundaries to assure that the project is manageable in scope. Carefully defining what you will and will not pursue is essential, as it is very tempting to go beyond the scope of the original project.

Finally, but most importantly, assure that top management supports the choice of process to benchmark. Conducting a successful benchmarking process requires significant staff time and resource commitment. Plus, once completed, you hope that recommended changes will be implemented. Securing top management support at the beginning is vital to success.

2. Understand your own process, including measurements.

Begin by assuring that all the right people are involved in the team. People should be selected for the different skills that they bring to the process as well as their position within the organization. Be sure that the “process owners” are involved in the benchmarking. They know more about the process than anyone and are essential participants in any benchmarking effort. In addition, you can learn more about the process from your customers and suppliers. They are in a unique position to offer a different perspective on how well the process works and what the problems are.

Analyze the data that you currently have about the process. Check items such as statistical reports, time studies, materials usage, customer satisfaction questionnaires, cost data, and so on. Be sure to seek additional measures if you need them.

Another tip -- Break the process down into smaller pieces to have a more complete understanding. Sometimes simply reviewing the process in detail can enlighten the team and more clearly define the task.

### 3. Select benchmarking partners.

As noted above, decide whether to use internal departments, competitive organizations, non-competitive organizations, or “world class” organizations. In this discussion, consider that the usual benchmark partners may not be appropriate for this project. Many companies tend to have certain other companies that they always look to for comparisons. However, they may not be appropriate for this particular process.

Approach partners with a request to participate. Some potential partners will decline, so alternates should be identified. Follow the benchmarking “Code of Conduct” regarding information sharing and encourage the partners to do so.

### 4. Gather data.

This is a critical aspect to the benchmarking process. Before asking questions of your benchmarking partners, you should be well prepared. Check available research on your process. Possible sources include:

- government documents
- national standards
- materials from professional associations
- web sites
- industry guidelines

Then, exchange written information with benchmark partners, for example, with a questionnaire. Finally, consider a site visit. Plan this as the last phase and prepare well in advance. Site visits provide the very useful information of first hand observation. However, they are expensive and should not be used to gather information that could be collected in writing or by telephone.

### 5. Analyze the data. Identify gaps between your processes and “the best.”

This is a very challenging part of benchmarking. You need to analyze your results and note all concrete measures of differences. Then, identify more qualitative measures, such as customer satisfaction.

Based on the data, try to understand HOW the partners manage the process differently. Identify specific ideas that could work to improve your process.

Develop a graph or similar representation of where you are compared to where you want to be.

### 6. Make recommendations for process improvements; sell the plan; implement.

Now you have reached the phase of making sure that the results of the benchmarking yield improvements. Begin by developing an action plan with specific steps, due dates and responsible parties. Be realistic. You may not be able to do everything at once.

Many people neglect the critical aspect of selling the plan to their decision makers. Try to anticipate your critics; if possible, win them over. Implementation may be faster if resources are allocated differently.

Finally, institute mechanisms to keep people interested in implementing changes. Implementation is an ongoing activity in which people can lose interest, so try to keep the interest level high.

#### 7. Continue to monitor and improve.

Avoid viewing benchmarking as a one-time activity, but rather consider this as one part of a continuous quality improvement effort. Stay in touch with your benchmarking partners. Let them know how things are going. Also, check with your customers and suppliers regarding their response to your process improvements. You can continue to receive important information from these partners.

### **Critical Factors in Successful Benchmarking**

Let us conclude by summarizing the experience of several authors, with the following recommendations to assure successful benchmarking:

- Be sure to involve the “process owners” in the benchmarking activity
- Allow adequate time and resources for planning and preparation
- Make sure that the decision-makers are really interested in the results of the project
- Keep them regularly informed of your progress
- Use the findings to generate real change

### **Workplace Trends**

Now we would like to shift our topic of conversation. With the ideas of benchmarking as a background, let us consider some of the trends that affect the delivery of occupational health services in today’s workplace. We’ll begin with trends in the workplace, and then consider trends in healthcare and behavior that affect the workplace.

Changes in the way we work will influence occupational health services in the future.

- Telecommuting, job sharing and other new work arrangements
- Changes in the implied employment contract
- Workforce demographics
- Education required of workers

Let’s consider each of these trends individually.

### **Telecommuting, Job Sharing, and Other New Work Arrangements**

#### Selected Trends

The use of technology has drastically changed the way people work and interact. More people are involved in telecommuting; important meetings are conducted by conference call rather than face-to-face; e-mail has replaced the telephone for routine communication.

The marked increase in the creation of “virtual offices” has resulted in a more fluid work environment for many categories of employee.

In a recent survey of benefits desired, the number one requested benefit was in the area of work/life services. “Family friendly” companies offer job sharing, flex time, and part-time employment as well as a variety of support services such as Employee Assistance Programs, childcare, and eldercare services. While many employees are working more hours per week, others are requesting, and receiving part-time or shared job opportunities. Work teams may increasingly function while only rarely seeing each other in person.

#### Selected Issues for Occupational Health

How should employers redesign their health benefits for part-time employees? At present many employers have restricted health benefits for part-time employees. If part-time work becomes a more common pattern of employment, how should health benefits be provided?

How do you provide occupational health services for employees that you never see? Many occupational health services are based upon the concept of having the employees readily accessible. How should a workforce that occupies “virtual” workplaces be managed from an occupational health perspective?

### **Changes in the Implied Employment Contract**

#### Selected Trends

A decade ago, many employees still expected that a single employer might provide employment for the extent of one’s career. This is no longer the case. The great amount of restructuring, layoffs, and job changes have had a profound effect on the US workforce. Younger employees in particular expect that they will not be with the company for more than a couple years. People change jobs much more frequently. As a result, definitions of loyalty, compensation and work productivity differ greatly.

#### Selected Issues for Occupational Health

Some Occupational Health departments have routinely conducted long-term epidemiological studies regarding health concerns in the workplace. How will these be conducted if the employee population changes often?

Should the employer pay for expensive treatment if there is little return on investment because the employee leaves? Historically, Occupational Health and Employee Assistance Programs have made the case for investing in relatively expensive treatments and/or treatment for stigmatized conditions such as chemical dependence by showing a return on investment to the employer. That is, it is less costly to treat an existing employee than to hire and train a new one. If employees leave frequently, will employers still see the value in providing healthcare?

## **Workforce Demographics**

### Selected Trends

The workforce is becoming increasingly diverse. There are more women and minorities in the workforce. A greater diversity of languages, religions, and cultural practices is represented. In some workplaces, this diversity has enhanced creativity and productivity; in others there has been conflict. The impact of the “baby boom” generation is beginning to be felt at work. As they face their middle years, this large group of employees is experiencing a variety of challenges. They often have both elderly parents and children to care for; they are sometimes facing their own confusion about mid-life; for many, they are having medical problems for the first time. The US workforce contains more international employees in response to the globalization of work.

### Selected Issues for Occupational Health

How do we better understand the health needs of a more diverse workforce? It is well known that many health research projects have not focused on women’s health, let alone the health of people with different ethnic backgrounds.

How do we address occupational health issues facing an aging workforce? Employers may face increased health care costs because of the aging workforce. What role can occupational health play in promoting health among this age group?

## **Education Required of Workers**

### Selected Trends

Many employers document an increased need for a specialized, technically trained workforce and complain of the growing gap between these needs and the preparation which prospective employees received at school. In response, employers have identified an increased need for on-the-job training and for teaching technical skills to unskilled workers. Other employers have developed partnerships with community colleges, but the concern about having enough skilled workers remains high.

Some employers have responded by importing foreign high-tech workers. In some work forces, the international composition of the workforce is very high, leading employers to adopt programs for managing immigration concerns, relocation, and adaptation to the US.

### Selected Issues for Occupational Health

What influence will increased expectation have on employee job stress? Stress has been shown to be related to many psychological and physiological health problems. Should occupational health be consulting more with employers to help reduce job stress?

Will occupational health assist in screening for job capability in different ways? Will there be increased demand for testing of physical capacity during an employee’s career?

## **Healthcare Trends**

With that overview of a few of the trends in how work is organized, let us consider some of the changes in the way health care is organized. Major changes in healthcare delivery overall will influence the organization and delivery of occupational health services. A few of the trends include:

- Employer-initiated changes in health benefits design
- Expansion of a variety of managed care arrangements
- Emphasis on disease management, early intervention, and prevention
- Greater ability to identify risk factors

## **Employer-Initiated Changes in Health Benefits Design**

### Selected Trends

Employers remain focused on short-term cost containment which drives employee health benefit plan design. Longer-term considerations, which might involve giving more treatment earlier to avoid higher costs later, do not seem to play a very big role in current plan design.

Eligibility concerns have surfaced for employers, as they struggle with what benefits to offer part-time employees, domestic partners, and non-traditional dependents.

Parity between mental and physical health benefits is the dominant legal concern at the moment. At the time of this presentation, about 19 states had mental health parity laws, and many others were considering implementation.

Concerns about pre-existing conditions and their cost implications remain an important issue for employers.

### Selected Issues for Occupational Health

How will laws affect employer choices? It is important for Occupational Health professionals to stay abreast of legal developments.

How should employers weigh cost and return on investment? Long-term vs. short-term financial planning is always an issue for employers, especially publicly traded employers who respond to quarterly expectations from investors. How will this vision apply to employee health concerns?

## **Expansion of a Variety of Managed Care Arrangements**

### Selected Trends

Employers have had enough experience with a variety of managed care arrangements that they are now moving away from discussing “managing cost” to “managing care.” This new emphasis on quality is changing the way managed care vendors respond to employers. Increased public dissatisfaction is also contributing to a more intensive examination of quality.

The largest managed care organizations are investing heavily in generating public sector business, e.g., Medicare and Medicaid. Some employers have expressed concern that this may divert their attention from their commercial business.

Those managed care organizations that are publicly traded face profitability pressures and increased scrutiny from stockholders.

The impact of managed care on the availability of both treatment services and qualified health care personnel will need to be watched.

#### Selected Issues for Occupational Health

What role should occupational health professionals play in helping employers evaluate their managed care options? For example, Occupational Health professionals might form strategic working relationships with employer Benefits Departments to provide information about medical trends which might assist in designing employee health benefits. The influence of Occupational Health could be significant in helping an employer focus on care as well as cost in health benefit plan design.

#### **Emphasis on Disease Management, Early Intervention, and Prevention**

##### Selected Issues

Disease management is today's hot topic in health care. Teaching patients to manage their own chronic diseases, such as diabetes and asthma, has been shown to reduce readmission and relapse rates. Interestingly, many of the techniques being developed for physical disease management, such as periodic consultation with a health professional, self-help group, education and information, support for following a disease management plan, have long been used by Employee Assistance Programs to promote successful recovery from alcoholism, another chronic illness.

There is increased emphasis on identification and early intervention of physical and mental health issues, using the workplace as a base. Employers sponsoring programs, such as health risk appraisals and depression screenings, which encourage employees to identify potential health risks and take action to reduce them.

##### Selected Issues for Occupational Health

How prepared are occupational health professionals to focus on prevention. For many occupational health departments, a shift to a preventive focus may require a fundamental redefinition of mission and objectives.

How can the financial benefit of these programs be demonstrated? Employers will need to be able to justify the costs of prevention programs, and occupational health professionals will have to be able to measure the impact of specific activities.

## **Greater Ability to Identify Risk Factors**

### Selected Trends

Physical and psychological factors are forming a large part of the decision in job placement. New tests to measure dexterity, mental capacity, and physical capacity are being developed and promoted to employers.

On the medical side, researchers have increased our ability to identify genetic predisposition to illness, and DNA testing is used in a wider variety of settings.

### Selected Issues for Occupational Health

Privacy concerns -- what should be kept in an occupational health record? Will there be increasing demand to keep a detailed medical profile on employees, including predisposition to various illness? How will occupational health records be protected?

Stigma--will employees be penalized for genetic predisposition? Will employees be even more reluctant to seek help with stigmatized conditions, such as mental health problems, if these are perceived as influencing their future job opportunities? How can Occupational Health work with employers to promote employee health while allaying these privacy concerns?

## **Trends in Occupational Health**

Now, thinking about benchmarking, trends in the workplace, and trends in the larger healthcare delivery systems, let us consider some specific issues in Occupational Health.

- Globalization
- Balancing work and leisure, work and family
- Monitoring employee health—understanding risk factors
- Psychological issues in the workplace
- Movement away from delivering care to managing health
- Importance of integrating with disability management, benefits, and workers compensation efforts to improve bottom line

### **Globalization**

Many Occupational Health departments are finding that the challenge of globalization is having a major impact on the tasks they are being asked to perform.

- Expatriate pre-screening and support are very important to reduce the likelihood of an expensive premature repatriation.
- Travel medicine is in increased demand to assist employees traveling internationally on both short and long-term business travel.
- Medical services for employees in developing countries are in many cases the direct responsibility of the employer. Occupational health departments are being called upon to guide these direct services.
- Occupational health professionals are being called on to develop international health facility standards, both for the direct services noted above, but also for other facilities which will be approved to treat local and expatriate employees.

- The effects of trans-meridian travel on health and decision-making are not yet well documented, yet employers are very interested in these issues, creating an opportunity for Occupational Health to propose solutions.

### **Balancing Work and Leisure, Work and Family**

As noted above, work and family balance is often rated in employee surveys as their number one concern. Finding “family friendly” employers is a top priority for some employees and work/life balance becomes a competitive issue in recruitment.

Occupational health departments are being called upon to address these concerns.

- More data are needed to help us understand how life balance (or imbalance) contributes to health and illness, and especially to know what impact this has on productivity.
- With the increased concern about violence in the workplace, the fact that it is often related to domestic violence leads to opportunities for Employee Assistance Program intervention and identification programs through occupational nursing.
- Shift work remains a common practice among many employers. More information needs to be learned, and shared with employers, regarding how biological rhythms are disrupted, judgment affected, and family stress increased.
- Reproductive health is an important issue. The effects of low-level exposures to certain chemicals on women are little known; even less is known about their effects on men. In addition to the strictly medical concerns, employers are increasingly accommodating needs of pregnant and nursing women, for example, by providing onsite nursing facilities and infant care. The input of Occupational Health into these services can be very valuable.
- Relocation and disruption of family life caused by frequent corporate moves and/or regular and frequent travel requirements are other areas where Occupational Health, EAP, and Work/Life professionals can interact to improve employee well being.

### **Monitoring Employee Health --Understanding Risk Factors**

The Occupational Health role in monitoring employee health faces some challenges, as noted above, due to the changing demographics of the workforce and changing expectations about length of employment. Some of the issues facing the Occupational Health professional today include:

- Differential diagnosis: How can we determine when an illness is work-related? This issue has important workers’ compensation cost implication and applies to psychological issues, such as work-related stress, as well as to physical illnesses.
- Epidemiology: How can we study possibly long-term effects of relatively low-level exposures when employees remain employed for shorter time periods?
- Determining what to monitor: With limited resources, Occupational Health professionals must determine what to monitor. Although law requires some monitoring, there are opportunities for other investigations. Some candidates for monitoring include immune function, respiratory function, and hearing.

- Maintaining up-to-date information and advising employers on risk factors: Employers and individual employees want to know how various risk factors, such as weight, smoking, diet, alcohol use, and exercise, can affect their health and what to do about it.
- Monitoring ongoing occupational health issues: There are continuing concerns about musculoskeletal problems and asbestos-related illnesses.

### **Psychological Issues in the Workplace**

When one thinks of psychological issues in the workplace, one usually thinks of the Employee Assistance Program. Yet, when compiling this list of current occupational health trends, it was the occupational physicians who mentioned psychological issues. Clearly, the interconnectedness of psychological and physical health, as well as the connection to the workplace, is increasingly being recognized.

- Stress is an increasingly common workers' compensation claim as well as a contributing factor to other physical and mental health problems.
- Conflict at work, including interpersonal conflicts between employee and employer as well as within employee groups, contributes to stress and may escalate into violence.
- Drug and alcohol problems remain a prominent concern among employers. Ongoing issues include surveillance, prevention, early intervention, identification and treatment.
- Depression and anxiety disorders have been identified as major factors in the workplace. Employers are involved in workplace screening programs for early identification and work-based responses. Also of interest is how work concerns contribute to individual employee depression.

### **Movement Away From Delivering Care to Managing Health**

Occupational health departments of the future will need to understand that employers envision the role of Occupational Health less as one of delivering care than of managing health. The expectation is that Occupational Health will take on the role of maintaining employee health to help improve productivity.

- The trend toward closing occupational medical clinics and emphasizing prevention will mean that clinic-related services are increasingly contracted out rather than provided directly by employers.
- There will be increased emphasis on risk management and risk reduction and how Occupational Health can contribute to these concerns.
- Most importantly, Occupational Health departments which survive and create vibrant services will also be required to demonstrate added value to internal customers. The importance of documenting value cannot be underestimated.

### **Importance of Integrating with Disability Management, Benefits, and Workers' Compensation Efforts to Improve Bottom Line**

The Occupational Health program that is isolationist will not survive. Employers are insisting on eliminating turf issues and developing a coordinated approach to maintaining a health work force. For example, some Occupational Health departments now have these other functions reporting to them whereas others are now run by managers rather than by physicians.

The Occupational Health programs of the future will be closely collaborative with at least:

- Employee Assistance
- Work/Life
- Health Promotion
- Risk Management
- Workers Compensation
- Disability Management
- Employee Health Benefits
- Organizational Effectiveness
- Ergonomics

In some cases Occupational Health may be the lead organization; in others not. The critical issue will be adding value in whatever way possible and documenting that financial impact on the bottom line. Occupational Health professionals will have to become increasingly business-minded to respond to the needs of their internal customers.

## **Conclusion**

In this presentation we have attempted to show how critically important it is for Occupational Health professionals and departments to concentrate on information in the larger environment which affects the delivery of Occupational Health services. Through benchmarking, Occupational Health Departments can gather vital information about how to improve specific processes. The forward-looking Occupational Health Department will incorporate benchmarking and continuous improvement mechanisms into its everyday operations.

Even more important is the need to focus on trends in workplace organization and in the delivery of health care services outside of the workplace. Changes in the way employees work and the attitudes which they hold about work and life balance can have profound impact on their health and productivity. Changes in the way health care is delivered will affect the possible responses that an employer can organize regarding employee health. Occupational health services need to be responsive to those concerns and to the employer's concerns for productivity.

Finally, we can not stress enough the importance of building partnerships and alliances within the employer organization. Occupational Health Departments must develop positive interaction and mutual support with a variety of other functions such as Benefits, Employee Assistance, Work/Life, Disability Management, Workers' Compensation, and Risk Management. Occupational Health can not focus on medical care, but must rather focus on promoting health and well being within the workplace. The focus on the workplace is essential to the usefulness of Occupational Health services to employers. Documenting the value of the services to financial success of the employer is absolutely essential.

Occupational Health Departments that are isolated, traditional, and resistant to change will not thrive and will not meet the needs of their employee and employer customers. However, for the Occupational Health Department that is collaborative, collegial, and productivity focused, many exciting opportunities await.

References:

The Benchmarking Handbook, Bjorn Andersen and Per-Gaute Pettersen, Chapman & Hall, London, First English language edition, 1996.

Benchmarking for Best Practices in the Public Sector, Patricia Keehley, Steven Medlin, Sue MacBride, Laura Longmire, Jossey-Bass, 1997.

Improving Through Benchmarking, Richard Y. Chang and P. Keith Kelly, Richard Chang Assoc. Inc., 1994.

The Guide to Benchmarking in Healthcare, Arthur G. Tween & Karol Garvin-Marciano, Quality Resource Books, New York, 1998.

Benchmarking for Best Practices -- Winning through Innovative Adaptation, Christopher E. Bogan & Michael J. English, R.R. Donnelley & Sons, 1994.

The Benchmarking Management Guide, American Productivity and Quality Council, Dallas, Productivity Press, Inc., 1993

## **SESSION II    Benchmarking Practices**

Session Chair: **G. Wyckliffe Hoffler, MD**  
Conference Technical Coordinator  
The Bionetics Corporation, Kennedy Space Center



Guest Speaker **Michael A Bell, MS**  
Manager, Benchmarking and Metrics, Business Innovation Group  
Kennedy Space Center



**Results Oriented Benchmarking: The Evolution of Benchmarking at NASA  
from Competitive Comparisons to World Class Space Partnerships**

Guest Speaker **Emmett B. Ferguson, MD, MPH**  
Manager, Occupational Health Program Support Office  
The Bionetics Corporation, Kennedy Space Center



**Benchmarking the Federal Agencies**

Guest Speaker **David K. McKenas, MD, MPH**  
Corporate Medical Director  
American Airlines, AMR Corporation



**Technological Advances in Travel Medicine**

Guest Speaker **Robert L. Weston, MD**  
President, International Healthcare Division  
International SOS Assistance, Inc.



**International Travel Health Considerations**

# **Results Oriented Benchmarking: The Evolution of Benchmarking at NASA from Competitive Comparisons to World Class Space Partnerships**

**Michael A. Bell, MS**

Manager, Benchmarking and Metrics  
Business Innovation Group, Kennedy Space Center

## **Introduction**

Informal benchmarking using personal or professional networks has taken place for many years at the Kennedy Space Center (KSC). The National Aeronautics and Space Administration (NASA) recognized early on, the need to formalize the benchmarking process for better utilization of resources and improved benchmarking performance. The need to compete in a faster, better, cheaper environment has been the catalyst for formalizing these efforts.

A pioneering benchmarking consortium was chartered at KSC in January 1994. The consortium known as the Kennedy Benchmarking Clearinghouse (KBC), is a collaborative effort of NASA and all major KSC contractors. The charter of this consortium is to facilitate effective benchmarking, and leverage the resulting quality improvements across KSC. The KBC acts as a resource with experienced facilitators and a proven process.

One of the initial actions of the KBC was to develop a holistic methodology for Center-wide benchmarking. This approach to Benchmarking integrates the best features of proven benchmarking models (i.e., Camp, Spendolini, Watson, and Balm). This cost-effective alternative to conventional Benchmarking approaches has provided a foundation for consistent benchmarking at KSC through the development of common terminology, tools, and techniques. Through these efforts a foundation and infrastructure has been built which allows short duration benchmarking studies yielding results gleaned from world class partners that can be readily implemented. The KBC has been recognized with the Silver Medal Award (in the applied research category) from the International Benchmarking Clearinghouse.

## **Benchmarking Methodology Overview**

The benchmarking process mimics the plan-do-study-act quality improvement cycle from the total quality literature. The initial steps involve planning the study and selecting benchmarking partners. Next, data is collected from the partners and is then evaluated to determine the "benchmark." Finally an implementation report is generated with specific actions to improve the process that was studied. Benchmarking does not conflict with other quality initiatives that may be in place; it is one of many process improvement tools. Benchmarking is a tool that can provide a proactive analysis of trends. Re-calibrating process measures through benchmarking ensure competitiveness of the process. Benchmarking contributes information and understanding that will be invaluable in other quality improvement efforts.

## **Pareto of Results**

The reason a benchmarking study is initiated is to produce tangible, applicable results that impact the bottom line. The major findings from benchmarking efforts at KSC have generally resulted in reduced costs (50%), recommendations that reduce cycle time (30%), and improvements to process reliability and quality (20%).

## **Benchmarking Results Case I: Government Property**

A benchmarking study of the government property management process at KSC was conducted. The goals of this study were to improve the accuracy of the property management system and reduce the resources expended in the effort. Within two months from the publication of study findings, three organizations reported a combined cost avoidance of over \$41,000. A fourth organization reported a 57% reduction in cycle time for processing Property Loss, Damaged or Destroyed (PLDD) reports; and a fifth organization reduced the number of PLDD reports processed by 84%. Continued informal benchmarking among process owners was an additional synergistic benefit of the consortium benchmarking study.

## **Benchmarking Results Case II: Hazardous Waste**

A benchmarking study of the hazardous waste disposal management process was initiated to discover best practices and efficiencies outside KSC for this activity. The original scope of the study was very broad. It encompassed policy making and the entire environmental management program. A lesson learned from this study was to select a manageable scope for the process with known beginning and ending points. The hazardous waste disposal process fit that criterion and was well documented.

Selecting benchmarking partners for the study resulted in lessons learned about having good partner selection criteria and the trade-off made in selecting benchmarking partners. This study involved use of electronic mail, Internet web sites, and teleconferencing. The use of existing technology proved that large amounts of money do not have to be spent to achieve results. This study identified several best practices; however, there were no quantitative comparisons done between partners. The inability to make numerical comparisons is sometimes the case, yet there was still significant and tangible benefit from conducting the study.

## **Value of Benchmarking Study Participation**

A component of developing world class space partnerships is to be open and willing to be a partner in another organization's benchmarking study. The advantage of being a participant in another organization's study is in sharing in the results from the effort without having to collect and analyze all the data. A disadvantage is that the desired outcome and direction of the study are formulated solely by the sponsoring organization. It might be a waste of time if the exchange of information is one sided. Also, the study

may lack focus and fall into the category of “industrial tourism”, which is when benchmarking partners arrange a plant visit just to see what is out there. The commitment of resources to host a benchmarking visit is typically well worth the insights that result. Participation in benchmarking requests is strongly encouraged as an efficient way to stimulate process improvement.

### **Insights and Lessons Learned**

Benchmarking requires the expenditure of scarce resources. In the current fiscal environment, a careful look is needed at how benchmarking can be done most efficiently while gaining the best results. It is possible to tie up resources in benchmarking efforts and receive little return for those efforts. Several areas are keys to short duration benchmarking studies yielding results gleaned from world class partners that are readily implemented. Selecting the right process to study, managing communication issues, utilizing effective team tools and metrics are components discussed below.

### **Selecting the Right Study**

Benchmarking should be a strategic decision based on organizational priorities and the potential return on investment. A formalized procedure for selecting processes that are strategically important to the organization is used at KSC. Analytic techniques or benchmarking software can be used to assist in this task. Establishing a clear project scope and narrowing the scope as appropriate is vital to an effective benchmarking study. It has been said that good benchmarking equals good choices (in selecting a study). To improve the implementation rate of best practice findings, strong, active support from management at the onset of the study and communication of why the changes are needed so that employees will commit to them is required. An ideal scenario is when management supports the entire program. Whenever they hear management speak, employees are constantly reminded that benchmarking and best practice sharing are important to senior management.

### **Communication**

One major advantage of benchmarking is that people do not have to “reinvent the wheel” to achieve improvements. There is great power in sharing and communications. A favorite phrase is “steal shamelessly and use what you can to make it better”. NASA policy requires searching the benchmarking project registry database before initiating a study. The database lists the results of past studies and teams are encouraged to write articles for the internal newsletters to promote the transfer of knowledge to as many people as possible. Too often there are islands of information in an organization and employees that can benefit from this knowledge never search it out. A standardization plan is an additional element that should be added to every implementation. The standardization plan details how the best practices and learning will be incorporated in other departments or Centers with similar functions.

### **Tools and Teaming Issues**

The team must get consensus on key performance indicators as early as possible to give better definition to the study area. Tools are available to provide access to information. Resources are available on the web and Internet, such as interactive training on quality tools, searchable electronic databases, library books and videotapes. Teams must take full advantage of technologies, such as e-mail and video conferencing technology. Communicating what is available and how tools can be used in improvement activities is vital to success. Just-in-Time training on benchmarking at various stages of the study and team dynamics training can help the team understand how to come to agreement. Sometimes, a major effort is required to get to the other side of the confusion curve.

### **Time**

One challenging aspect of benchmarking is dedicating the time to do it. Benchmarking practitioners have identified "lack of available time" as a major reason given for not benchmarking. Some times a "kaizen blitz" is used where team members dedicate a large block of time to work on only one thing and stay until it is complete. Reducing the time and speeding up the benchmarking process itself, is a goal.

### **Summary**

Benchmarking can be thought of as a license to "steal shamelessly" since there is no reason to reinvent the wheel. The key to a successful study is to start out and maintain focus on the desired results. Managing communication, teaming issues and effective use of continuous improvement tools are the backbone of results-oriented benchmarking.

# **Benchmarking the Federal Agencies**

**Emmett B. Ferguson, Jr. MD, MPH**  
Manager, Occupational Health Program Support Office  
The Bionetics Corporation, Kennedy Space Center

## **Introduction**

The theme of benchmarking for this year's annual conference was selected almost one year ago. A group of excellent speakers was identified to discuss the process of benchmarking and describe some of the outstanding examples in corporate occupational health.

The possibility was recognized that there might be excellent examples of occupational health services in the Federal sector. A meeting to discuss benchmarking Occupational Health Services in the Federal agencies was held early this year. Based on these discussions, a study was funded to identify the best practices and innovative approaches within other Federal agencies that provide employee health services.

The study is intended to scope the investment in occupational health services in the Federal government and to recommend a benchmarking approach that can be used by the NASA centers as an ongoing program evaluation tool.

## **Key Services**

The following key services in the occupational health program of other agencies and departments were thought to be worthy of evaluation:

1. Quality, cost-effective services to employees
2. Availability and access to occupational health program services
3. Treatment of work related illnesses and injuries and workers' compensation case management
4. Prevention oriented illness and injury investigation
5. Surveillance physical examinations
6. Emergency medical services
7. Health education and wellness programs to include on-site exercise facilities
8. Employee assistance programs
9. Quality assurance for the services provided (to include metrics and data collection systems)
10. Programs for contractor oversight
11. Health information management systems
12. Program assessment processes
13. Program cost information (such as, cost per capita or other suitable comparison)
14. Relevant reference materials that are available
15. Points of contact within each agency to further investigate outstanding occupational health services.

## Overview

The tasks and deliverables were divided into three phases and negotiated with the contractor in the Washington, DC area. The presentation this afternoon constitutes an interim report, as the project has not yet been completed. A final project report should be available later this year. The slides today present the high points of the benchmarking effort to date.

The offices visited by the contractor for support and information included the Office of Personnel Management, Occupational Safety and Health Administration Office and the Federal Agencies Program Interagency Benchmarking and the Best Practices Council.

The Interagency Benchmarking and Best Practices Council was chartered in 1996 by five agencies:

- Department of Transportation
- Veteran's Administration
- Internal Revenue Service
- Department of Energy
- Patent and Trademark Office

The Best Practices Council team now has representatives from thirteen federal organizations, including NASA. The Council encourages the agencies to share their best practices. To date, there are no occupational health best practices in the system. There is commitment from the NASA representative to keep the Agency Occupational Health Program Office apprised of any related benchmarking investigations.

## Selected Federal Agencies and Departments

The contractor visited the following agencies and departments:

Department of Health and Human Services	Federal Aviation Administration
Department of Interior	Internal Revenue Service
Department of State	National Institutes of Health
Department of Transportation	U.S. Coast Guard
Environmental Protection Agency	U.S. Postal Service

The **Department of Health and Human Services** has nine major components. The Occupational Health Services are decentralized. These components use a common occupational health program manual, which was developed by the Federal Occupational Health Services and is available for sharing with other federal agencies.

The **Department of Interior** has an interesting behavioral study of 20,000 employees in progress to gain insight into the reasons for their high, lost-time injury rate. This department has many remote locations and small employee groups that may take perhaps unnecessary risks. This behavioral study may provide insight on how to go about preventing lost-time injuries. One operating location of the department has completed and been approved for the Occupational Safety and Health Administration Voluntary

Protection Program. The department also has an extensive training program on CD-ROM and a comprehensive occupational medicine manual and handbook available on the Internet at: <http://medical.smis.doi.gov/>.

The **Department of State** established the Federal Safety Director's Roundtable to identify and share best practices. Reports of this roundtable meeting are available. An outstanding pesticide use and control program was developed because of identified problems at some remote international locations. This department has also published a comprehensive newsletter entitled "Safety/Health Watch" for their worldwide workforce.

The **Department of Transportation** provides policy guidance to eight components through the Safety and Occupational Health Manager that reports to the Assistant Secretary for Administration. One of the outstanding benchmark services provided by the department is an extensive fitness program for which there is a three-dollar per week user fee.

The **Environmental Protection Agency** was found to have some outstanding multimedia training materials that have been peer reviewed and beta tested. This agency is making those training materials available to NASA and will distribute the CD-ROM to the center representatives at this meeting.

The **Federal Aviation Administration** also has outstanding training systems. This agency has completed an in-depth analysis of training costs and costs/benefits of providing in-house training. They also have developed a manual on self-directed learning that covers the use of new training and learning technologies.

The **Internal Revenue Service** has an outstanding ergonomics program and extensive training materials. They have certified ergonomists that have indicated their availability for consultation to other Federal agencies. There has also been a detailed analysis of the Office of Workers' Compensation Program, rehabilitation, return-to-work, and disability management practices.

The **National Institutes of Health** use the Internet for employee and family information services. Its Web site that is available to employees and families. They provide training programs on the use of the Internet to family members. As might be expected, they also have an outstanding bio-safety program and outstanding training services. A comprehensive wellness program concentrates on services provided at periodic health fairs.

The **U.S. Coast Guard** was found to have an outstanding training program for collateral duty personnel working in health and safety. Many of their health and safety employees provide those services as additional or secondary duties and hence, the collateral training is a requirement for their posting.

The **U. S. Postal Service** has an outstanding ergonomics program. They have looked extensively into how to control injury costs through disability management and early return to work. Their limited duty and medical management programs are among the best investigated. There is an outstanding Health and Safety Supervisor Manual published by the U.S. Postal Service. Mr. Jerry Jones, the U.S. Postal Service Risk Manager, will discuss these programs this afternoon.

## **Summary**

This benchmarking effort has reported the following findings:

- There is an increased use of partnering and sharing to leverage resources in these times of reduced budget but increased responsibilities.
- There is an ongoing effort to develop outstanding training materials and share these materials within the federal government.
- Many of the departments visited have outstanding ergonomics programs and indicated that this was a primary emphasis beyond the generic training effort in occupational safety and health.
- Very few departments had effective metrics, in fact, in most of the agencies visited, the only metrics were developed from the OWCP reports that are required from all the organizations.
- Generally the Health and Safety Program Managers report directly to the Secretary or Assistant Secretary and have very good support within the governmental departments.
- Occupational health budgets are under pressure. The remarks regarding the need for sharing and the need for benchmarking within other organizations reflect this situation.
- Very little uniformity exists in the organizational structures and the approach to occupational safety and health among the agencies.
- Availability of health maintenance exams was not uniform. Health maintenance exams were not routinely given to employees unless they were required by some union agreement.
- Several agencies were found to have Internet or Web sites that provide useful information for other organizations.
- Some agencies recover costs of medical care from insurance carriers. There is some effort to explore the potential for such cost recovery on a greater scale.
- The best of the fitness programs that were reviewed in this benchmarking effort were those charging a user fee.

A number of documents and training manuals that were obtained by the contractor are on display during this Occupational Health Conference. In addition, a list of the individuals and offices contacted during the benchmarking survey project is included. The individuals on that list have generally indicated to the contractor that they would be willing to discuss the details of the programs that may have been reported during this session.

**Individuals and Offices Contacted  
During the Benchmarking Survey Project**

**Department of Agriculture**

*Jim Stevens*  
(202) 720-9686

**Department of Energy**

*Joe Fitzgerald, Jr.*  
*Les Bemseley*  
(301) 903-9879

*Dennis Lubow* – Training

**OSHA**

*Mary Leonard*  
(202) 219-9329 ext. 169

**Department of Interior**

*Ray Kunicki*  
Director, Safety and Occupational Health  
1849 C Street, NW  
Washington, DC 20240  
(202) 219-0189

*Bob Garby*

Industrial Hygienist  
Denver, Colorado  
(303) 236-7128 ext. 230

**Department of Labor**

*Colleen Geraghty*  
Acting Director of Safety and Health  
(202) 219-6687 (or 9086)

**Department of Transportation**

*John Hancock*  
[Now at VA (202) 273-9742]

*Christine Barrett*

Acting Safety and Occupational Health  
Manager  
(202) 366-0038

*Linda Rhoades*

Worklife Wellness  
400 7<sup>th</sup> Street, SW, Room 2318  
Washington, DC  
(202) 366-6774

**Department of Treasury**

*Joe Bocci*  
(201) 622-0728

**Environmental Protection Agency**

*Julius Jimeno*  
Director, Safety, Health and  
Environmental Management  
401 M Street  
Washington, DC 20460  
(202) 260-1640

*Dr. Gerald Oakley*

Director, Multimedia Laboratory  
(202) 260-1287

**Federal Aviation Administration**

*Dr. Michael Thomas* – Safety  
Office of Environment and Energy  
800 Independence Avenue  
Washington, DC  
(202) 493-4292

*Irma Hart, RN*

Manager Health Awareness Program  
(202) 267-7964

*Mary Sands*

Instructional Systems Design Specialist  
(202) 493-4069

Policy and Oversight

*Tom Holloway*  
Manager, Facility, Environment and  
Safety Division  
(202) 267-8114

*Jeanne Kosch*  
Safety and Occupational Health Manager  
(202) 267-9719

*Lita Arnold*  
Industrial Hygienist  
(202) 267-9762

Implementation  
*Bill Kansier*, Safety and Occupational  
Health  
A & S 500 Implementation of Policy  
(202) 267-8679

*Sherry Elliott*  
(202) 267-7568 (or 9786)

*Bob Rams*  
(202) 267-7325

Occupational Medicine  
*Peggy Guy*  
(202) 267-3405

"*Sam*" *Hart*  
(202) 267-7965

**Federal Energy Regulatory  
Commission**  
*Rick Harding*  
825 N. Capital St. NE  
Washington, DC

**Food and Drug Administration**  
*Dr. Naresh Chawla*  
(301) 827-1010

**Health and Human Services**  
*Joe Manchester*  
Director, Division of Policy Coordination  
and Facilities Management  
330 Independence Avenue  
Washington, DC  
(202) 619-1994

*Dick Green*  
Director, Safety, Occupational Health,  
and  
Environmental Programs  
(202) 619-0426

**Internal Revenue Service**  
*Thomas S. Myerchin*  
Director of Education  
(703) 308-6150

*Larry A. Blevins*  
(703) 308-6220

*Jessie Walters*  
Industrial Hygienist  
(202) 535-4221

*Ed Crandel*  
Industrial Hygienist  
(202) 535-4221

*Barbara Cohen*  
Ergonomist  
(202) 535-4221 ext. 3010

*Janet Miles*  
Occupational Medicine and OWCP  
(202) 874-9371

*Carolyn Webb*  
Workers Compensation Center  
(804) 771-2820

*Lawrence Schleifer*  
Industrial Psychologist/Ergonomist

**J.J. Keller and Associates**  
*Linda Bloom*, Multimedia training  
(800) 843-3174 ext. 2454

*Kris Roberts*, Sales  
(800) 558-5011 ext. 2575

**Lockheed Martin**

*Carl L. Batton*  
400 Virginia Avenue  
Washington, DC  
(202) 646-5403

**National Institutes of Health**

*Alfred Ferruggiaro*  
Senior Industrial Hygienist  
(301) 496-3353

*Michelle Markley*  
Training Specialist for Safety and Health  
Bethesda, MD 20892  
(301) 496-2346

*Rosamond A. Rutledge-Burns*  
Chief Safety Operations Section  
(301) 496-2346

**National Technical Information Services**

*George Ziener - Training*  
(703) 487-4778

**Occupational Safety and Health Administration**

*Mary Leonard*  
(202) 219-9329 ext. 169

*Ron Cain*  
(202) 219-8152 (or 8148)

**Office of Personnel Management**

*Carol Hallowell*  
(202) 606-1438

*Frank Cavanaugh*  
(202) 606-1166

**Social Security Administration**

*Betsy Bale*  
(410) 965-9308

**Tennessee Valley Authority**

*Gary DePew*  
(423) 632-7756

**U.S. Army**

*Lt. Col. Steve Richards*  
Pentagon 2E577  
(703) 697-0440

*Col. Wolfe*  
Army Medical Department

*Gary Avriez*  
Assistant for Safety  
(703) 697-0440

**U.S. Coast Guard**

*Albert Kotz*  
2100 2<sup>nd</sup> Street, SW  
Washington, DC  
(202) 267-2957

**U.S. Government Printing Office**

*Dr. William T. Harris*  
(201) 572-1210

**U.S. Postal Service**

*Jerry Jones*  
Manager, Risk Management  
475 L'Enfant Plaza, SW  
Washington, DC 20260  
(202) 268-3690

*Dr. David Reed*  
Medical Director

*Larry B. Anderson*  
(202) 268-3675

# Technological Advances in Travel Medicine

**David K. McKenas, MD, MPH**

Corporate Medical Director

American Airlines

AMR Corporation

## Introduction

It has been said that 100,000 people, the population of a moderate-sized city, travel in the skies over the domestic United States at any moment. Unlike a city, however, not much in the way of on-board emergency medical systems are available to them—that is, until recently. Many factors went into American's decision to greatly enhance on-board medical equipment on its fleet, and this paper will present that rationale. All major air carriers are following American's lead in these programs, and as a result, many customer lives will be saved, and on-board passenger medical morbidity due to on-board illnesses and emergencies will be reduced.

## Factors for Consideration

Until recently, the only medical capability on board commercial aircraft was the minimum standard contents mandated by the Federal Aviation Administration (FAA). The FAA freely notes that these are minimum requirements. Air carriers can enhance on-board medical response capability, so long as they maintain these minimum items.

## FAA-Required Medical Kit\*

- Oropharyngeal Airway
- Blood Pressure Cuff
- Antiseptic Wipes
- Tourniquet
- Stethoscope
- Sterile Gloves
- Dextrose
- Hypodermic Needles
- Hypodermic Syringes
- Diphenhydramine
- Nitroglycerin
- Epinephrine

*\*Kit contents selected based on FAA usage research*

The minimum standards in the United States are starkly contrasted with the contents of enhanced medical kits in foreign carriers. This difference becomes especially noteworthy as United States air carriers are forming alliances and code share arrangements with international carriers.

## Comparison of Domestic U.S. Carriers with International Carriers

	<i>Angina</i>	<i>Cardiac</i>	<i>Seizure</i>	<i>Allergy</i>	<i>Blood Sugar</i>
<b>U.S Carriers</b>	Yes	<b>No</b>	<b>No</b>	Yes	Yes
<b>Air Canada</b>	Yes	No	No	Yes	Yes
<b>British Airways</b>	Yes	Yes	Yes	Yes	Yes
<b>Cathay Pacific</b>	Yes	Yes	Yes	Yes	Yes
<b>Japan Airlines</b>	Yes	Yes	<b>No</b>	Yes	Yes
<b>Lufthansa</b>	Yes	Yes	Yes	Yes	Yes
<b>Qantas</b>	Yes	Yes	Yes	Yes	Yes
<b>SAS</b>	Yes	Yes	Yes	Yes	Yes
<b>Virgin Atlantic</b>	Yes	Yes	Yes	Yes	Yes

## Comparison of Domestic U.S. Carriers with International Carriers

	<i>Mental Illness</i>	<i>Drug Overdose</i>	<i>Asthma</i>	<i>GI</i>	<i>Birth</i>
<b>U.S Carriers</b>	<b>No</b>	<b>No</b>	<b>No</b>	<b>No</b>	<b>No</b>
<b>Air Canada</b>	Yes	Yes	Yes	Yes	<b>No</b>
<b>British Airways</b>	<b>No</b>	<b>No</b>	Yes	Yes	Yes
<b>Cathay Pacific</b>	Yes	<b>No</b>	Yes	Yes	Yes
<b>Japan Airlines</b>	Yes	<b>No</b>	Yes	Yes	Yes
<b>Lufthansa</b>	<b>No</b>	<b>No</b>	Yes	Yes	Yes
<b>Qantas</b>	Yes	Yes	Yes	Yes	Yes
<b>SAS</b>	Yes	<b>No</b>	Yes	Yes	<b>No</b>
<b>Virgin Atlantic</b>	<b>No</b>	Yes	<b>No</b>	Yes	<b>No</b>

Further, many of our physician customers regularly write to critique the kits, when they become involved in medical events. They note that stethoscopes are useless in a noisy aircraft environment, and the medications were not adequate for the emergencies that they were facing.<sup>1</sup>

---

<sup>1</sup>As an interesting aside, American's marketing surveys show that doctors are on board our flights 85% of the time, it made good sense to design on board medical supplies based on voluntary physician response. Although American does not pay responding physicians, it does reward them with an AAdvantage account, if they do not have one, complete with 15,000 miles, or an award of 15,000 miles into their already existing account. It is interesting that the medical department at American Airlines, which is quite large (over 120 physicians and certified occupational health nurses and laboratory staff), not only provides medical service to a diverse occupational population, but also must constantly be attuned to the 'business' aspects of American Airlines, as evidenced by the physician AAdvantage program. It is important for all of us, as occupational medicine professionals, to constantly share the business perspective of the company we serve, or services could be considered non-essential.

At American Airlines, we also noted that our medical diversion rate, although rare, was higher than that of other United States air carriers.

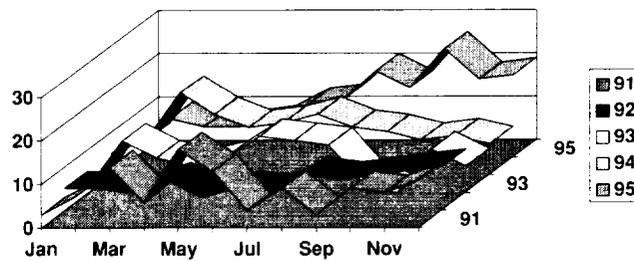
### Other Airline Comparisons Medical Diversion/Billion RPM\*

	1991	1992	1993	1994	1995
American *	1.29	0.77	0.92	1.30	1.52
Air Canada*	0.59	1.60	1.38	0.87	0.90
Air Alaska	-	-	-	1.57	-
America West	-	-	-	1.48	-
Canadian*	-	0.64	0.70	0.27	0.65
Continental	-	-	0.60	0.93	-
Delta*	1.55	1.89	1.63	1.33	-
Northwest	-	-	-	1.40	-
United *	0.31	0.26	0.21	0.42	-

\* expressed as 10<sup>2</sup>  
\*\* Airlines with In-House Medical Departments

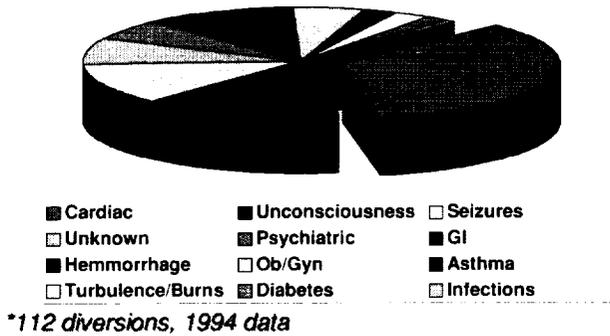
We noted too that our emergency landings for medical reasons were on an upward trend in 1995:

### Summary of Emergency Medical Landings, 1991-1995



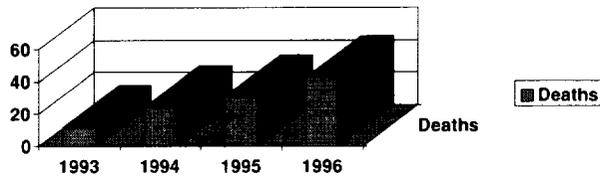
We also noted that the predominant reason for medical diversions related to cardiac events:

### Medical Reasons for Diversions\*



And we finally noticed that our in-flight ‘deaths’ were on the rise. Although in the past, we did not track outcomes of medical events on board, we define ‘deaths’ as cases where the customer had no pulse, no breathing, and was unresponsive, and the flight attendants administers mouth to mouth resuscitation and closed chest compression:

### In-Flight Death Patterns



One tool American Airlines uses is to have a doctor available to the cockpit 24 hours daily to give real time advice in the event of medical emergencies. This physician also advises our special reservations offices that handle customers with special medical needs and ensures that customers are stable for air travel. One study showed 112 diversions in 1994, but, if these cases had been pre-coordinated with an AA Medical physician, none would have caused a diversion.

Despite our Physician-on-Call program, however, we continued to notice a great mismatch between the content of the existing medical kits, and the conditions for which we were diverting. The predominant areas of mismatch were in the areas of cardiac events, seizure disorders and asthmatic disorders. We speculate that this mismatch may have occurred because the population demographics of travelers have changed since the study to determine the contents of the current minimum standard kit was conducted by the Federal Aviation Administration in the 1980's. Another cause of the mismatch may have been the passage of the Americans with Disabilities Act, which has increased the number of persons with medical problems flying as air travelers.

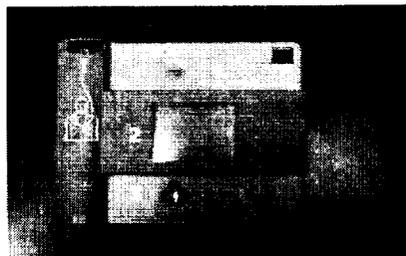
### **Cardiovascular Events**

Sudden cardiac events are the most common in-flight medical event and are a major cause of medical diversions. As we all know well, cardiovascular disease is a leading cause of death in the United States. It is expected that these conditions will roll over into the traveling public, which is, for the most part, a cross section of our society. In the United States, 1.25 million people have heart attacks each year. From an epidemiological perspective, people with cardiovascular disease are younger than was previously found. Also, more women are also having manifestations of cardiovascular disease than was noted in previous years.

Sudden cardiac arrest may be the first and only sign of cardiovascular disease. Anywhere from 750 to 1000 persons per day suffer from sudden cardiac arrest in the United States, which is, in most cases, lethal unless promptly treated. In most cases also, it is all but impossible to predict who will have a sudden cardiac arrest, or where or when it will happen. The odds of surviving a sudden cardiac arrest are less than one in ten, with most persons dying before reaching a hospital. Those people who do survive a cardiac arrest have a good chance of living many more years. Approximately 80 percent are alive after one year, and as many as 57 percent are alive after five years.

Ventricular fibrillation is the most common cardiac arrest rhythm, and is most effectively treated with prompt defibrillation. The odds of successful defibrillation decreases 7-10% every minute; therefore, lifesaving Automatic External Defibrillators (AEDs) need to be in the hands of non-traditional first responders, those people who are first at the scene of such an event, such as policeman, firefighters, and now with American Airlines, flight attendants.

#### **Automatic External Defibrillators**



After reviewing all of the statistics and data, American's management became convinced that we could do more for our customers in the area of urgent medical response. We began exploring automatic technology in earnest in the summer of 1996. We saw many advantages of AEDs for commercial aviation. AEDs are expert devices that detect shockable rhythms and are extremely easy to use. The captive, seated population permits an immediate response from the flight attendant. Where a paramedic can take from 8 to 20 minutes to respond, the flight attendant could respond well within five minutes. The aircraft environment has good crowd control and also control of lighting and climate.

Of course, there are disadvantages. We quickly recognized that there was no economic advantage to putting defibrillators on board our flights. They cost a good deal of money, and further, 20,000 flight attendants would require training. American came to the conclusion that it was the right thing to do, regardless of the fact that there was no cost return. Further, there certainly would be liability if they were misused; however, we felt that as the devices are so simple to use, we had little concern in this area. Our position was that we would rather defend the case where we did all we could to help a customer survive, than the case where this lifesaving equipment was not available. Recently, the Aviation Assistance Act of 1998 expands the liability protection of responding physicians on airliners.

Further, there are safety impacts of putting electronic equipment on board. The units were extensively reviewed at our maintenance avionics testing units, along with the FAA, and were found to be safe for use, with no navigational electromagnetic field impacts. And then there is the issue of training 20,000 flight attendants on using the AED. Because we were in a cutting edge, and largely unexplored programmatic area, we elected to start with our over-water fleet of 242 planes. We started training with just the Purser corps of flight attendants, who are the lead flight attendants on over-water flights. This group numbered just 2,300, a more manageable number. We gave them three hours of initial training, with a one-hour didactic lecture on fundamental electrophysiologic background and machine operation. We concluded with two hours of hands on experience at four scenario stations. The flight attendants are already trained in cardiopulmonary resuscitation (CPR) as well as basic first aid. It was a relatively simple change to their training algorithm to apply the AED just prior to starting CPR (no pulse, no breathing and unresponsive customers). The AED would then talk to the flight attendant and direct them as to what to do from then on. Each year, the flight attendants also receive recurrent training on the AED usage. The program is sponsored by, and directed by, the American Airlines medical department. It is one stellar example of an in-house medical department of a large commercial air carrier providing a program which supports the primary mission of the airline: safely getting customers from one location to another.

Logistics and equipment maintenance are a very complex set of issues that need to be explored when placing advanced equipment on board large fleets of planes. We elected a defibrillator that did not require to be wired in to the planes power source. A wire-in requires substantial approval procedures through the FAA. Instead, we chose a device that is very low maintenance and uses lithium batteries. The battery in a powered unit lasts 14

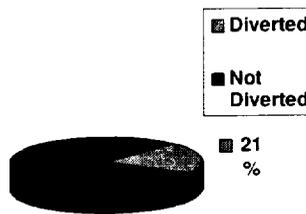
months and the spare packaged battery in the kit lasts for five years. The device performs system self-checks nightly. The flight attendants and the nightly cabin service personnel both check the device daily. If the defibrillator indicator box flashes a red 'X' or the device chirps, they swap out the device, and the AED comes to the Medical Department for refurbishment.

Another logistical issue is where to place the units. We created a multi-union/company task force to address this singular issue. From a marketing perspective, we wanted to avoid overhead space so as not to detract from space available for customers, but in *many* fleet subtypes, this was the only suitable location for the device.

We placed the devices on all over-water-equipped planes and went live with the program on July 1, 1997. The accompanying chart shows the uses at seven months. Since that time, we have had well over 65 uses of the device, mostly as a monitor. Because this is such a changing number, real-time statistics were presented at the conference.

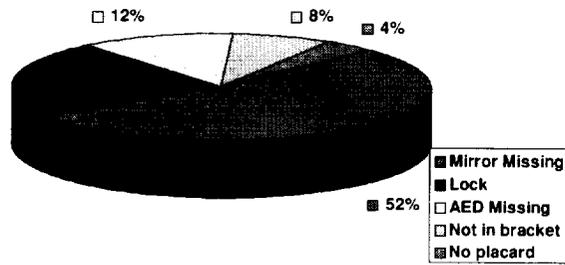
## Defibrillator Uses

- 39 Uses 27 uses in 7 months
  - 4.5 uses per month
  - mostly as a cardiac monitor
  - offered, but not used, 10 times
  - Apparent deaths in 5 out of 39 cases
  - One Complete Save



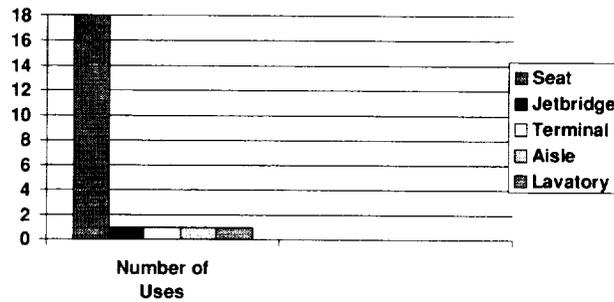
We carefully trended problems through real-time flight attendant reports. The mirror apparatus that we devised to make the daily checks easier did not work. Also we, on occasion, had instances where the lock would not open with some of the 20,000 cockpit keys already used by flight crews around our system. These problems were fixed whenever they were discovered.

## Reported Problems



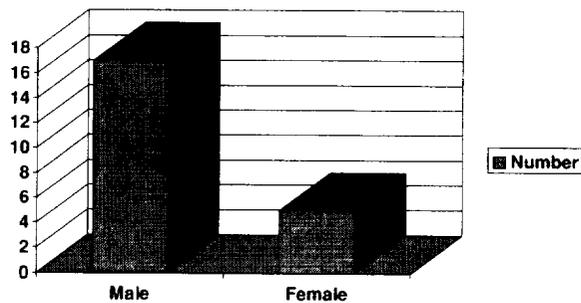
Most of the time, the device was applied right in the seat, although we do train the flight attendants to apply the device with the unresponsive customer in the aisle.

## Cases: Where Event Occurred



The device usage thus far has been predominantly in male customers:

## Sex



Our first complete save was a 53-year-old businessman who was traveling to Mexico on a vacation trip. He became suddenly unresponsive on board. The flight attendant and an on-board paramedic used the AED to revive him in just five minutes. He was in a classic ventricular fibrillation. The paramedics arrived eight minutes later. He required no other therapies from the paramedics at that time, other than oxygen and a precautionary IV.

A notable side benefit of the Defibrillator program was its marketing aspects, although this never entered into the decision to implement such a program. The wife of our first customer save expressed the following sentiments publicly:

*“For a few minutes, I was a widow. I think that if we’d been anywhere else, I’d still be a widow. They [the flight attendants] acted so quickly, it was just amazing. I’ll never fly another airline.”*

And also:

*“...I’ll never get on a plane again that doesn’t have one of these machines. American Airlines did this voluntarily. No law forced them to. I don’t know why other airlines haven’t done this. I mean, I don’t care whether we get peanuts or not.”*

American also has elected to place Bystander kits on all of its flights to stabilize most emergencies that we encounter. These kits will all be on board, in addition to our AEDs by February 1999.

## **Summary**

American’s efforts to enhance on-board medical response have trickled through the industry and all major carriers are now following suit. We are pleased to have been the catalyst in making air travel even safer for the traveling public by bringing state-of-the-art technology into commercial airliners.

## **International Travel Health Considerations**

**Robert L. Weston, MD**

President, International Healthcare Division  
International SOS Assistance, Inc.

### **Introduction**

As a result of the merger between SOS and AEA International, the new organization combines the worldwide experience of two major assistance companies providing answers to the needs of governmental organizations like NASA and major corporations throughout the world. More than just an emergency assistance company, it has expanded products and services to recognize the evolving needs of emerging global economies and global risks.

Traditional emergency assistance programs provide for medical referral, evacuation, or repatriation services as needed. Newer security and travel health programs provide preventive measures in the form of reports to best prepare expatriates for overseas duties. Integrated global programs even provide for on-site medical surveys defining the risks of establishing offshore corporate presence as well as establishing, staffing and managing on-site occupational medical clinics for clients.

Existing clients may not recognize that the combined resources of AEA and SOS include 22 Alarm Centers open 24 hours daily, 100 remote site facilities and 22 medical clinics operating worldwide. It stands as one of the world's largest health care networks working today to meet the needs of globalization with improved communications, developing technologies, and unmatched cumulative experience.

The presentation summarized the development and evolution of the travel medicine specialty (Emporiatics). The major travel medicine problems (diarrhea, accident, illness, malaria), evolution of entry requirements, eradication programs, emergence and re-emergence of infectious disease, special risks, preventive measures, political and environmental risks, stress of overseas duties, and the need for reliable resources and assistance were reviewed. Copies of a Travel Care® booklet entitled "General Travel Information" were given to participants.

Questions about International SOS Assistance's Security Overseas Program with online Internet reports were answered. A projected demonstration of the new Travel Care web site to go online in September 1998 was given. The extensive state-of-the-art travel health database is capable of daily updates from a broad range of reliable travel health resources (Centers for Disease Control, U.S. State Department, World Health Organization, etc.). Using a friendly web browser, the Itinerary Maker produces a rapid, customized and integrated report for multiple countries explaining country immunization requirements, recommendations, preventive measures, advisories and public announcements. The following information regarding general travel was presented.

## **Before Traveling**

1) Learn about potential problems and how to decrease risks. 2) Get appropriate immunizations and preventive medications. 3) Learn about appropriate response to obvious exposure or illness. 4) Learn about post-trip evaluation and response to illness.

## **Basic Recommendations**

- Know your risk; some countries have higher risk than others do.
- Determine if antimalarials are required.
- Begin recommended immunizations several months before departure.
- Obtain address and telephone number of the American Embassy in each country you visit which is included in U.S. State Department Advisory (excellent source for overseas physicians and hospitals).
- Develop a plan for illness or disability.
- Ascertain if health insurance covers illness abroad.
- Carry adequate supplies of all required medications (including syringes, if needed).
- Plan for adjusting medication schedule to new time zones.
- Take an extra pair of glasses or lenses and lens solution, and optical prescription.
- Carry identification.
- Take a basic first aid kit.

## **Immunizations**

- May be standard, required, or highly recommended.
- Check with your physician about updating standard immunizations (Tetanus, Measles, Polio, and others).
- Obtain immunizations required by individual countries (Yellow Fever), or recommended because of itinerary and style of travel (Typhoid, Hepatitis A and B, Rabies, Japanese Encephalitis, Meningococcus, and others).

## **First Aid/Travel Kit**

May include tweezers, needle, pocket knife, scissors, flashlight, Band-Aids, sterile 4x4 gauze pads, adhesive tape, povidone-iodine solution for skin disinfection, antibiotic ointment, pain/fever medication (aspirin, acetaminophen, ibuprofen), antifungal cream, cortisone cream, and antihistamine tablets. Also should include insect repellents and insecticides, water purification tablets, sunblock, and medications for diarrhea/dehydration, and altitude and motion sickness as described below.

## **Take Appropriate Precautions**

### **Insect borne diseases (Vector borne)**

Vaccines or drugs do not prevent many insect-transmitted diseases. Some insect-borne diseases like dengue fever are transmitted during the day, but malaria is transmitted from dusk until dawn. Avoid rural side trips if possible, leave rural areas before dusk, avoid still water ponds and lagoons, use insect repellents (a 35% non-absorbable formulation of

N, N diethyl-m-toluamide, DEET (Ultrathon, 3M), is optimal), wear clothes that cover arms and legs, spray clothing with permethrin (Permanone), stay indoors in screened rooms from sunset until morning, spray rooms with pyrethrum-containing flying-insect sprays, and sleep under permethrin-impregnated bed nets. TAKE ANTI-MALARIA MEDICATION.

### **Food and water borne disease (Travelers' Diarrhea)**

It is optimal to drink water boiled for ten minutes. For each mile of altitude add five minutes to boiling. Bottled carbonated beverages, beer, and wine are acceptable. Avoid ice, and use fresh straws and disposable cups if possible. Don't brush teeth or clean contacts in unboiled local water. Carry immersion coil to boil water. Less preferable are iodine tablets or other water purification systems. Eat only well cooked food. Avoid salads, other uncooked vegetables, creamy deserts, and food sold by street vendors. Make sure that milk, cheese, and other dairy products have been pasteurized. Eat only fruits that you peel yourself. Develop a plan with a physician for treatment of diarrhea. This may include bismuth subsalicylate (Pepto-Bismol), an antibiotic such as ciprofloxacin, an antimotility agent like loperamide (Imodium), a fluid/electrolyte solution like IAMAT Oral Rehydration Salts, and reporting to a physician if diarrhea contains blood or pus. If travel is short term and diarrhea is unacceptable, consider prophylaxis with bismuth-subsalicylate or an antibiotic.

### **Motor vehicle accidents**

In some areas motor vehicle accidents are the leading cause of medical problems among tourists. Avoid riding motorcycles or wear a helmet, don't drink and drive, avoid traveling in crowded buses, trucks and taxis, request rental cars with seat belts, and bring infant car seats.

### **Schistosomiasis and other diseases transmitted by contact with skin**

DO NOT SWIM, BATHE, OR WADE IN FRESH WATER, STREAMS, LAKES OR RIVERS WHERE SCHISTOSOMIASIS IS TRANSMITTED. If contact with such water occurs, immediately towel dry. Inquire about jellyfish and other poisonous sea creatures. Wear protective clothing (long sleeves and pants, socks, shoes). Do not walk barefoot.

### **AIDS/HIV, Hepatitis B, and other sexually transmitted diseases**

Avoid contact with blood or body fluids of other individuals. Avoid injections. Practice safe sex. Always use condoms with spermicides.

### **Heat and sun exposure**

Avoid sun between 10AM and 2PM, wear protective clothing/hats and sunglasses, drink lots of fluids, avoid alcohol, use air-conditioning, and always use sunscreens and lip balms with UVA and UVB sun protective factor of a least 8.

### **Cold exposure**

Bring adequate clothing. Avoid excess alcohol. If frozen extremity, avoid thawing and refreezing.

**Altitude sickness**

Slow ascent is the cornerstone of prevention of altitude sickness, 1000 feet per day above 10,000 feet. The altitude at which the climber sleeps is critical. It is recommended that one should climb "high" and sleep "low". At high altitude the climber should not overexert, and should eat a high carbohydrate, low-fat diet, and avoid excessive salt. Acetazolamide (Diamox) when begun before rapid ascent and continued for 1-2 days after arrival aids in acclimatization. Dexamethasone decreases the symptoms of altitude sickness, but does not enhance acclimatization. A recent study suggests nifedipine may be useful in preventing altitude sickness.

**Motion sickness**

This can generally be prevented with over the counter antihistamine tablets (Dramamine, Bonine) or with prescription products (Transderm Scop patches).

**Jet Lag**

This may be unavoidable. Recent studies suggest that exposure to as much sunlight as possible after arrival may reduce jet lag. Consider adopting the new time zone sleeping schedule as early as possible. The best strategy may be regular sleep, diet, exercise, and avoidance of alcohol.

**Radiation**

The Chernobyl nuclear accident resulted in the largest release of radiation ever recorded affecting the Ukraine, Belarus and Russia. Travelers should avoid controlled areas and long term travelers should investigate local conditions prior to residence. Travelers should drink bottled water, avoid wild or uncontrolled foodstuffs. Young children, babies, nursing infants and pregnant women are at greatest risk.

**Poisonous snakes**

Most bites are a result of handling or harassing. Less than half the bites contain venom but medical attention should be sought. Use mosquito nets, protective clothes and shake out clothes and boots in the morning. Scorpions are painful but seldom dangerous except to small children.

**Pregnancy**

Travel is not a problem for the healthy woman with a normal pregnancy. If possible, administration of live vaccines is avoided during pregnancy, while inactivated vaccines are generally thought to be safe. Because the long-term effects of new antimalarials have not been adequately evaluated, the worldwide spread of chloroquine resistant *P. falciparum* has made chemoprophylaxis for women in the childbearing years often difficult. Flying is generally not limited until the 36th week. The obstetrician should be consulted.

**Appropriate Response to Illness after Returning Home**

Make certain that you inform your health care provider that you have traveled recently, provide the itinerary, and share your knowledge of the diseases to which you may have been exposed. If you develop a fever during the two years after returning from a malarious area, and there is no obvious cause for the fever, you must demand that malaria smears be done every 12 hours for 48 hours to rule out malaria.

### **SESSION III Benchmarking Realities**

Session Chair: **Steven G. Brisbin, MS**  
Senior Environmental Health Officer, NASA Occupational Health Program Office  
Kennedy Space Center



Guest Speaker **William V. Bates, Jr., BS**  
Chief of Staff, Space Station Program Office  
Johnson space Center



#### **International Space Station Overview**

Guest Speaker **Peter T. Palmer, PhD**  
Department of Chemistry and Biochemistry  
San Francisco State University



**Direct Sampling Ion Trap Mass Spectrometry—  
A New Tool for Environmental Monitoring**

Guest Speaker **Jerry A. Jones, WSO, CSE, CSM**  
Manager, Risk Management, U. S. Postal Service Headquarters  
Washington, DC



**U.S. Postal Service Safety and Risk Management Overview**

Guest Speaker **Ron Z. Goetzel, PhD**  
Vice President and Director of Health and Productivity Management  
The MEDSTAT Group, Washington, DC



**Developing Normative and Benchmark Data for Health and Productivity  
Management: Results of a Multi-Employer Benchmarking Study**

# **International Space Station Overview**

**William V. Bates, Jr. BS**

Chief of Staff, International Space Station  
Johnson Space Center

## **Space Station Program**

### ***Vision...***

A gateway to permanent human presence in space for the expansion of knowledge benefiting all people and nations.

### ***Mission...***

Build and operate the International Space Station-- a world class orbital research facility that is safe, productive, affordable, and on schedule!

## **Why A Space Station?**

The International Space Station is an end in itself - a world class orbiting research facility. The International Space Station is also a means to an end.

**Forge new partnerships with the nations of the world**

**Inspire the next generation**

**Invest in the future**

- Aerospace development
- Deep space exploration

## **What will we do on the International Space Station?**

Learn to live and work in space with ever-increasing productivity

**Conduct Scientific Research**

- Physics, Chemistry, Biology

**Conduct Technology Research**

- Engineering applications of scientific results

**Conduct Commercial Applications Research**

- New products
- Existing product improvement

**We are going there to learn!**

## **The International Space Station Program Phases**

We are concurrently building and operating through three phases of development.

***Phase 1 - Shuttle-Mir Program recently completed with much success***

***Phase 2 - Assured early research and permanent crew capability. Planning operations, building hardware, and preparing for first two launches***

***Phase 3 - International science capability and final assembly***

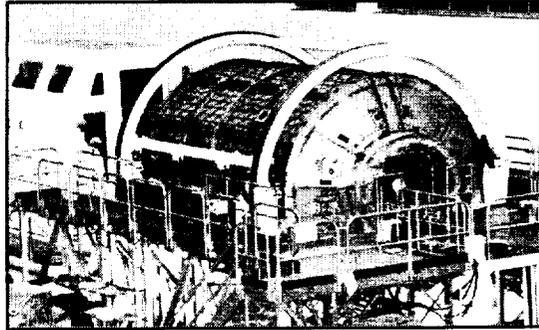
## U.S. Lab Outfitting -- Flight 5A.1 (March 2000)

### Element

- Systems racks to complete U.S. Lab system outfitting

### Status

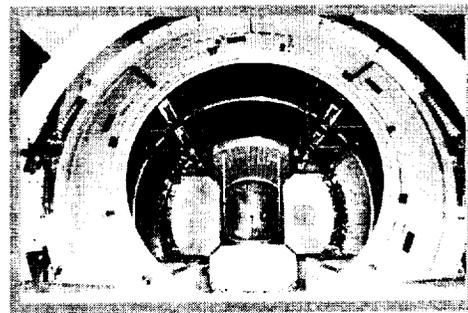
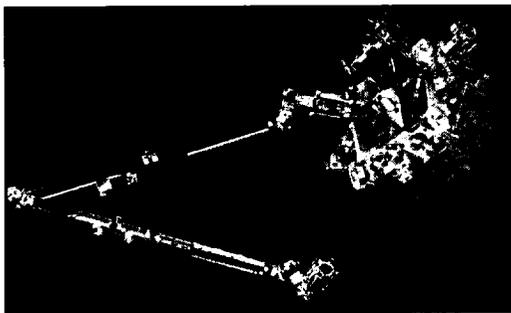
- Baselined into Program for launch immediately following the U.S. Lab
- "Leonardo" connector cleaning is in progress at KSC



## MPLM/SSRMS -- Flight 6A (April 2000)

### Element

- The MPLM carries U.S. LAB outfitting equipment with 6 system racks and one storage rack
- The UHF antenna provides space-to-space communications capability for US based Extra-Vehicular Activity
- The SSRMS adds capability of handling large payloads and assisting with docking the Shuttle
- It's self-re-locatable with a Latching End Effector, so it can be attached to complementary ports spread throughout the Station's exterior surfaces
- It will play a key role in ISS assembly and maintenance



### Status

- Primary fittings on Raphael MPLM have been installed at Alenia
- SSRMS continues integrated testing in Canada in preparation for delivery to KSC in February 1999
- The SSRMS robotic workstation is undergoing testing
- Lab Cradle Assembly (LCA) fitcheck is scheduled for July 1999 at KSC

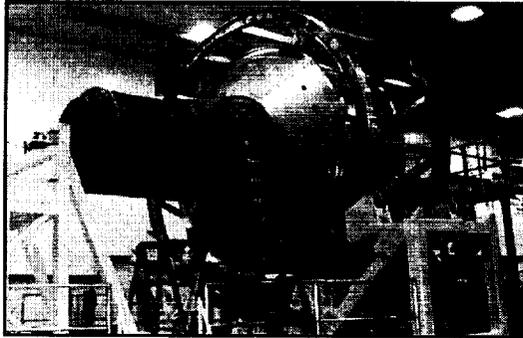
## **Airlock -- Flight 7A (July 2000)**

### **Element**

- Airlock provides Station-based EVA capability for US and Russian suits
- High Pressure Gas assembly augments the Service Module gas resupply system
- 7A completes Phase 2 of the Assembly Sequence

### **Status**

- Successfully completed individual and integrated testing of Avionics and Cabin Air Racks
- All Endcone installations have been completed (Y1 through Y4)
- Began installation of Standoffs (X1 & X2)
- Began installation of tertiary structure for plumbing & wiring
- Completed rework of coldplates and reinstalled into Avionics Racks



## **Functional Cargo Block (FGB) “Zayra” -- Flight 1 A/R**

**(November 1998)**

### **Element**

- Zayra is the first element of the ISS, to be launched on a Russian Proton rocket from Baikonur!
- It will provide the initial propulsion and power
- It will provide orbital control, communications, and power for the US-built Node 1
- It will control the motion and maintain the altitude of the Station's orbit
- It will primarily provide storage capacity in the later phases of assembly

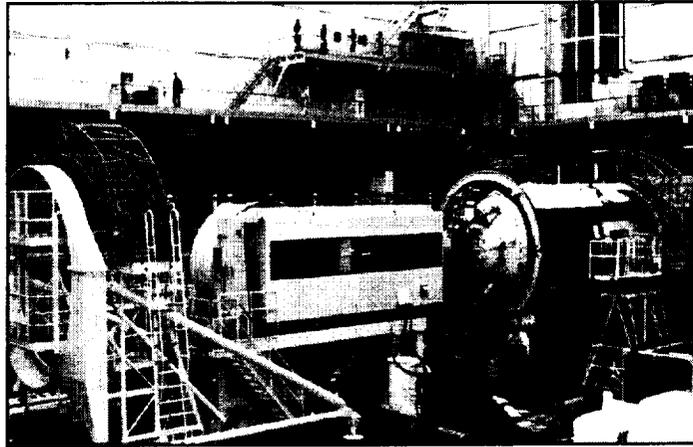
### **Status**

#### **FGB**

- Successful launch from Baikonur, Kazakstan, 11/20/98

#### **Proton**

- Mated to FGB on 11/16/98 in prep for launch
- Final fueling was completed at L-30 minutes



**FEL successfully launched!**

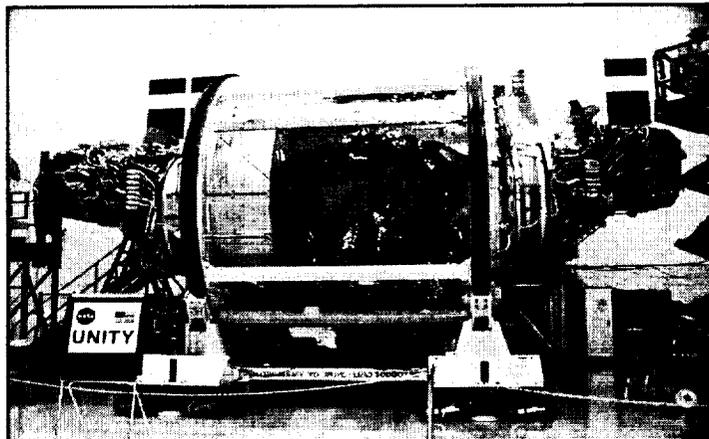
## **Node 1 “Unity” -- Flight 2A (December 1998)**

### **Element**

- Eventually, Unity’s 6 ports will provide connecting points for the FGB, Z1 truss; U.S. lab; airlock; cupola; Node 2; and the early MPLM “Leonardo”
- It’s launched passive with Pressurized Mating Adapter 1 and 2 and one stowage rack
- PMA-1 provides the interfaces between U.S. and Russian elements
- PMA-2 provides a Shuttle docking location

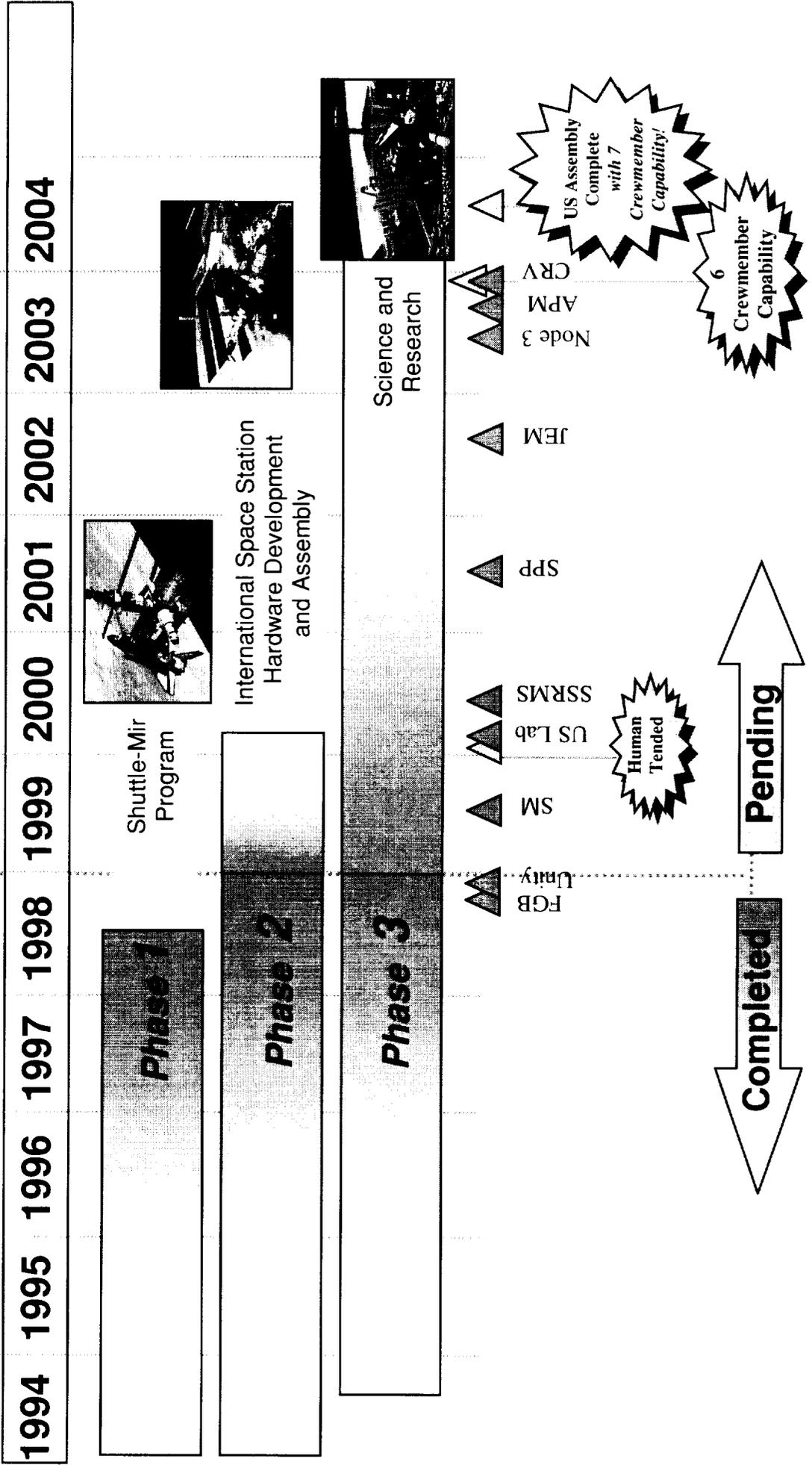
### **Status**

- Installed into Endeavor on 11/13/98
- Payload Bay checkouts completed 11/30/98
- Successful launch from Cape Canaveral, FL, Friday, 12/4/98, and a successful landing on 12/15/98



**We Are the New Star on the Horizon!**

Phase 2 is underway!



# Direct Sampling Ion Trap Mass Spectrometry— A New Tool for Environmental Monitoring

**Peter T. Palmer, PhD**

Department of Chemistry and Biochemistry  
San Francisco State University

## **Abstract**

The recent development of a collection of techniques referred to as direct sampling ion trap mass spectrometry (DSITMS) shows great promise for real-time, high-throughput, low-cost screening of environmental pollutants in air. One of its great strengths is the flexibility it allows the user in choosing among different sample introduction systems, ionization modes, and scan modes. This presentation delineates the various stages involved in a DSITMS analysis, describes the options and great flexibility inherent in each of these stages, and demonstrates the use of DSITMS techniques for monitoring trace levels of volatile organic compounds (VOCs) in Mir space station air samples.

## **Introduction**

The growing prospect of long-term human presence in space necessitates the development of increasingly complex life support systems. These systems may be based on physiochemical and/or bioregenerative principles, include redundant air purification subsystems, and utilize space suits as a last line of defense. Regardless of these measures, some means for monitoring air quality is needed to provide detailed information on air composition and ensure human health. In past space missions, this entailed the use of sensors to measure bulk species such as oxygen, nitrogen, water, and carbon dioxide. In more recent Shuttle and Mir missions, archival sampling followed by chemical analysis in ground-base laboratories has been relied on to provide *ipso facto* measurements of trace levels of VOCs. As the frequency and duration of space missions increase, the need for *on-line, in-situ* measurement of a wide variety of trace level contaminants in air will become a priority.

The need for more advanced life support systems and a wide variety of Earth-based environmental monitoring applications continue to drive the development of new technology for measuring the types and concentrations of various contaminants in air. The primary focus is on developing more sensitive, faster, and portable instrumentation. Each application presents its own unique constraints with respect to detection limits, scope, speed, and size. Detection limits may range from percent levels for bulk analytes such as oxygen and nitrogen, to parts-per-million (ppmv) levels for permanent gases such as carbon dioxide and methane, and parts-per-billion (ppbv) and parts-per-trillion (pptv) levels for trace and ultratrace levels of VOCs. In some cases selectivity for a specific target compound or limited set of compounds is more important, whereas in others a more general detector is required to analyze for a wide variety of compounds. Many of these applications require an instrument with fast cycle times to monitor rapid changes in concentration and composition. The last and most important criterion is the ability to perform the analysis on-site versus collecting the sample for later analysis in an off-site laboratory.

## **GC/MS**

The most common techniques used to measure trace levels of VOCs in air are those based on the standard Environmental Protection Agency (EPA) methods TO-1, TO-2, and TO-14. These methods involve a preconcentration step to physically separate the VOCs from the bulk of the air sample, gas chromatography (GC) to separate them in time, and a suitable detector to quantitate them. In many cases, mass spectrometry (MS) is used to provide more definitive and reliable detection of specific VOCs. Although these methods are proven and accepted, they are not capable of providing the fast analysis speeds and rapid turnaround times required for many applications, and are generally too complex to be suitable for field or space deployment.

## **Ion Traps**

Ion trap mass spectrometry (ITMS) has generated intense interest in recent years and promises to be the high performance mass analyzer of the future. It is small, relatively simple, and inexpensive. It is recognized as one of the most sensitive mass spectrometers currently available. It has excellent experimental versatility and is capable of collecting electron ionization (EI), chemical ionization (CI), and sequential stages of MS (i.e., MS/MS, MS/MS/MS, MS<sup>n</sup>) data. This tandem mass spectrometry capability is particularly valuable for real-time monitoring applications, in which additional stages of MS can be used to tailor the selectivity of the analysis to the compound and matrix of interest. Collectively, these features make the ion trap well suited for a host of air quality monitoring applications. It should be noted that although a number of ion traps have been modified for field applications, no commercial vendor has produced a true field-portable ion trap instrument.

## **DSITMS**

A technique referred to as DSITMS promises to revolutionize the way air quality monitoring is done. DSITMS often eliminates or obviates the need for preconcentration and separation stages that are essential in the EPA TO-1, TO-2, and TO-14 methods. Instead, the sensitivity and tandem mass spectrometry capability of the ion trap are exploited to enable rapid, selective, and direct monitoring of VOCs in air. The focus of this presentation is delineating the various stages involved in a DSITMS analysis, describing the options and great flexibility inherent in each of these stages, and demonstrating DSITMS techniques for monitoring trace levels of VOCs in Mir space station air samples.

## **Conclusions**

Although the focus of this research is application of DSITMS technology to monitoring air quality for advanced life support applications, a number of ground-based applications also stand to benefit from this technology. Recent passage of the Clean Air Act requires the monitoring of hundreds of VOCs to ensure compliance with EPA emission limits. A host of other applications including process control, fence-post monitoring, stack monitoring, engine exhaust analysis, water quality monitoring, and human breath analysis require advanced technology for sensitive, selective monitoring of specific contaminants in air.

A variety of sensors and instrumentation has been developed to monitor specific contaminants in air. While these can be sensitive, fast, and miniaturized, they generally are limited to measurement of a specific permanent gas such as carbon dioxide or total organic carbon. These sensors are clearly unsuitable for providing detailed composition data for a wide range of VOCs in air. Gas chromatography/ion mobility spectrometry (GC/IMS) has received increased attention in recent years. IMS by itself is incapable of providing either sufficient mass resolution or selectivity to monitor a wide range of VOCs. But in conjunction with preconcentration and fast GC, this technique shown itself to be capable of reliably identifying and quantitating a wide range of VOCs at ppbv levels with an analysis time of 10 minutes. The most impressive feature of GC/IMS is its size: a complete system with a size on the order of 2 ft<sup>3</sup> has already been flown on the Space Shuttle.

The first commercial ion trap instrument was made available in 1986. Since that time, ion trap mass spectrometry has enjoyed rapid growth and extensive commercialization. While initially dismissed as a simple GC detector, the ion trap is now recognized a high performance mass analyzer. The field of DSITMS is newer still and has been primarily driven by a number of research groups using this technique for real-time monitoring and environmental screening applications. Given the limited space, weight, and power on a space platform, perhaps the most important consideration for the application of DSITMS for life support monitoring is field portability. Although there are numerous vendors of ion trap instrumentation, none offer a commercial version intended for field applications. One vendor had developed a prototype field-portable DSITMS instrument. Some of the specifications of this prototype are illuminating: a size of approximately 3 ft<sup>3</sup> and a weight of 65 lbs. The system is controlled from a portable PC. Unfortunately, this vendor has since discontinued these efforts.

With respect to air quality monitoring, the most important features of DSITMS are its ability to provide real-time measurements, the selectivity made possible through tandem MS scan modes, and the simplicity of the technique insofar that neither preconcentration nor GC is required. While DSITMS applications thus far have been limited to monitoring of ppbv and higher concentrations of VOCs in air, development of improved sample introduction systems extending detection limits into the low pptv range will greatly facilitate the utility of DSITMS for monitoring ambient levels of VOCs. And although DSITMS techniques are not yet widely accepted, this should change with the proposed adoption of a new EPA method 8265 for DSITMS measurement of VOCs in air. Further refinement, miniaturization, and maturation of ion trap technology will eventually make the DSITMS technique a viable option for air quality monitoring on a space platform.

# **U.S. Postal Service Safety and Risk Management Overview**

**Jerry A. Jones, WSO, CSE, CSM**  
Manager, Risk Management  
U..S. Postal Service Headquarters, Washington, DC

## ***Editor's Note:***

The Benchmarking study mentioned earlier in the program provided a large amount of information from other government agencies. Perhaps the most impressive and useful with regard to implementation of well-conceived programs was by the U. S. Postal Services.

Mr. Jerry A Jones is the manager of Risk Management for the U.S. Postal Services. His description of the health and safety services implemented for the 890,000 employees in more than 38,000 locations illustrated the magnitude of the undertaking. The salient features of the program are outlined in the following material that address programs, strategies and assessment of outcomes.

## **Safety and Workplace Assistance**

### **How the Mail Gets Delivered**

- 312,000 mail collection boxes
- 38,000 post offices (270 million square feet)
- 130 million delivery points
- 107 billion pieces first class mail every year
- 192,000 vehicles (2 billion miles driven)
- 3.4 billion pieces of mail delivered each week
- 890,000 employees (1.5 billion work hours)

### **Exposures**

- Material handling
- Motor vehicle
- Slips, trips, falls
- Striking against/by
- Animals

### **Loss Control Strategies**

- Comprehensive safety and health program
- Second to none safety management program
- Injury compensation case management program
  - National workers' compensation task force
  - Limited duty task force
  - Injury compensation training
  - Quality medical case management
    - Nurse coordination program and medical bill review

## **Enhancing the Workplace**

- Special Emphasis Safety Management Programs
- Applied Technology to Enhance Safety and Productivity
- Safety and Health Training
- Safety and Health Inspections
- Associate Supervisor Program
- Crisis Management Teams
- Safety and Health Performance Measurement
- Safety and Health Recognition
- Management Accountability/ Incentive
- Safety Captains
- Corporate Safety Communication
- Employee Assistance Program
- Environmental Management Process
- Safety and Health Committee Activities
- Medical Management Program

## **Workers' Compensation Task Force**

- Nationwide effort to focus emphasis on safety and claims management
- Established to assist areas and districts in identifying OWCP
- Task Force sponsored and funded by Headquarters
- Cooperative effort with OWCP

## **Case File Reviews**

- Priority Group 1 – Age 49 and under, injured less than 5 years
- Priority Group 2 – Age 49 and under, injured more than 5 years
- Priority Group 3 – Age 50-60, regardless of injury date
- Priority Group 4 – Age over 60, regardless of injury date

## **Force Case File Ratings**

- Rating 1 – Compensation can be terminated or reduced within 6 months
- Rating 2 – Compensation can be terminated or reduced within 6 to 12 months
- Rating 3 – Some potential for returning to work
- Rating 4 – No return to work potential

## **Nurse Coordination Program**

- Purpose: Ensure that injured employees receive prompt, appropriate medical care and fully coordinated safe return to work at the earliest possible time
- Key Elements
  - NCP is totally voluntary for injured employee participation
  - Functions within the framework of FECA and postal policies
  - Special cases (catastrophic injuries and other complicated cases expected to extend beyond the COP period) will be referred to OWCP as soon as possible
  - ICCO staff will ensure smooth transfer of case to OWCP for case management by OWCP staff.

## **How to Enhance Performance Level?**

### Safety

Key Strategy: Accident Prevention

- Involves supervisors/employees in identifying potential safety hazards
- Work together as a cohesive team with injury compensation and operations

### Injury Compensation

- Provide ongoing training to supervisors emphasizing critical role of supervisors in managing OWCP claims
- Establish open communications with medical, safety, operations, area IC staff, and other district peers
- Use Handbook EL-505 (available online)

# Developing Normative and Benchmark Data For Health and Productivity Management: Results of a Multi-Employer Benchmarking Study

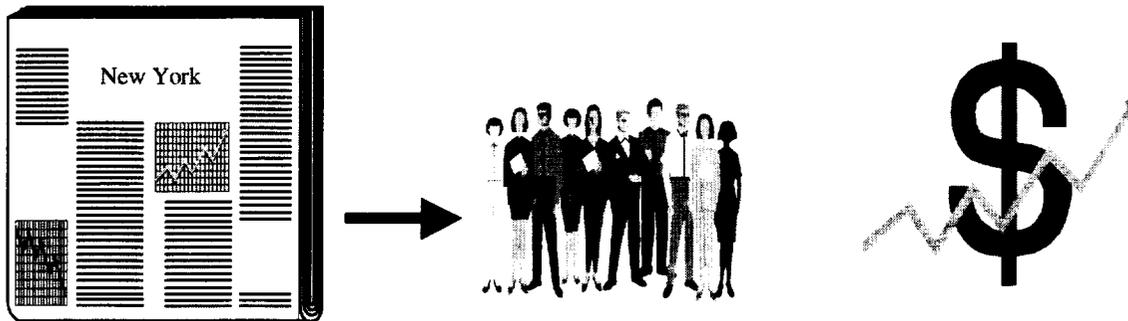
**Ron Z. Goetzel, PhD**

Vice President and Director of Health and Productivity Management  
The MEDSTAT Group, Washington, DC

## Agenda

- Developing a Model for Health and Productivity Management (HPM)
- Results of the American Productivity and Quality Council (APQC)/MEDSTAT HPM Consortium Benchmarking Study
- Case Studies of Best Practice Organizations
- Implications and Future Directions

Health and Productivity Management is an emerging business strategy, based on integrated information and aimed at improving the total value of human resource investments. It establishes the link between people, health, and profits.



Today's Business Climate

People/Operational  
Challenges

Impact on Health  
and Productivity

## Mechanism of Operation

- Identify factors that influence employee health and well being regardless of "program"
- Measure and manage performance of program "packages" in aggregate in order to impact total organization performance
- Coordinate, prioritize and justify targeted interventions aimed at individuals, providers, conditions, plans and locations—and the organization as a whole

And these functions must operate in a multifaceted complexity, literally a maze of such factors as:

- Group Health Plans
- Performance Management
- Environmental Health and Safety

- Organization Development
- Workers' Compensation
- Health/Demand/Disease Management
- Employee Assistance Program
- Legal Issues
- STD/LTD

### **The Business Case for HPM (Corp XYZ)**

Corp XYZ makes a significant investment in human capital, its maintenance costs are substantial, and a significant cost of maintenance is associated with "health":

- health benefit plan
- long term disability
- salary replacement for STD
- workers' compensation
- occupational health services
- health promotion
- epidemiology
- industrial hygiene
- safety
- sick leave
- demand management
- case management
- return to work planning
- restricted work assignment
- absenteeism
- EAP/psychological services
- ADA/FMLA compliance

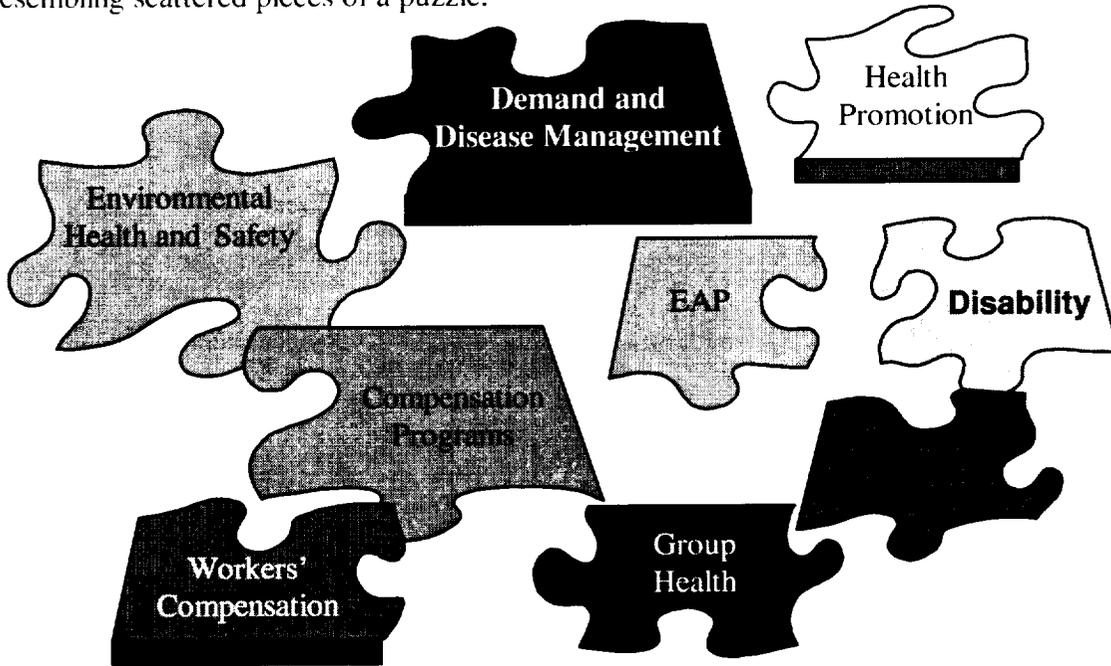
Costs for programs are interdependent and management of programs is disconnected. With a reduced workforce, it is more critical to minimize time away from work. In the age of "knowledge workers," achieving high productivity results in a competitive advantage. There is an opportunity to capture, manage and improve the maintenance expenditures associated with Corp XYZ's human capital investment.

### **Increased Health and Productivity Risks**

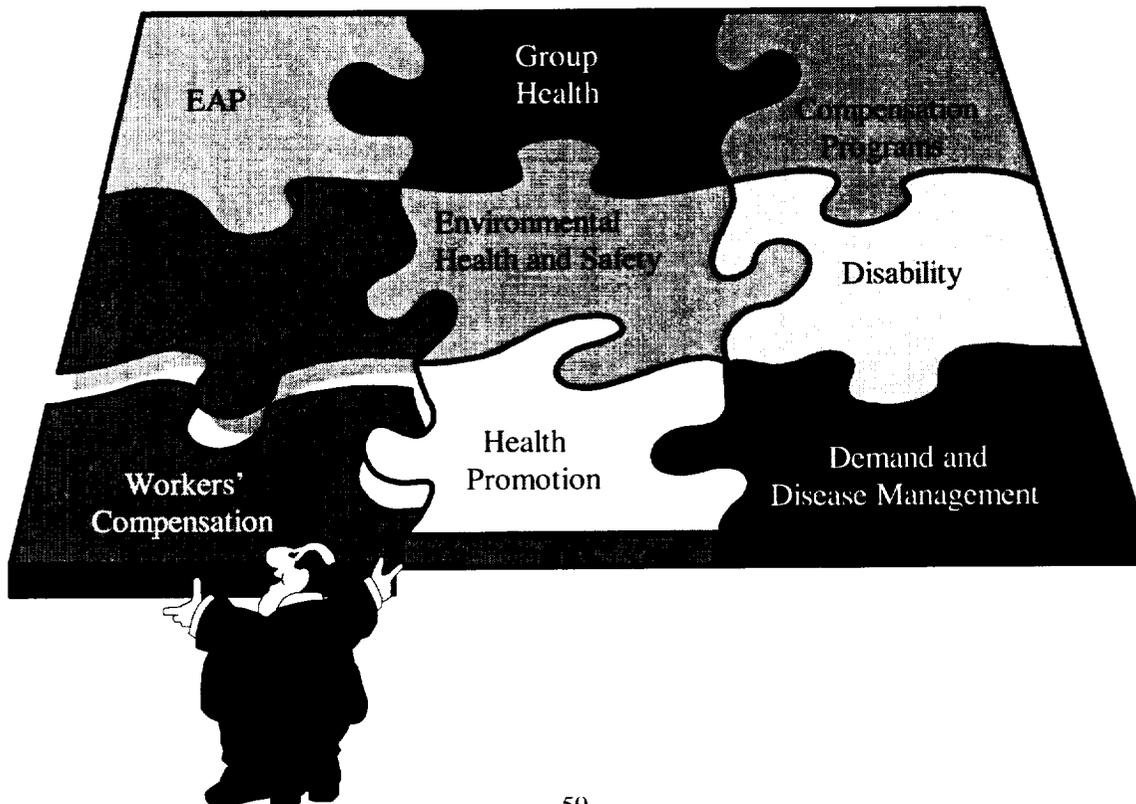
- |                        |  |
|------------------------|--|
| <b>Medical:</b>        | Chest/back pain, heart disease, GI disorders, headaches, dizziness, weakness, repetitive motion injuries |
| <b>Psychological:</b>  | Anxiety, aggression, irritability, apathy, boredom, depression, loneliness, fatigue, moodiness, insomnia |
| <b>Behavioral:</b>     | Accidents, drug/alcohol abuse, eating disorders, smoking, tardiness, "exaggerated" diseases              |
| <b>Organizational:</b> | Absence, work relations, turnover, morale, job satisfaction, productivity                                |

Typical responses to these risks have been to manage disability, manage healthcare, manage health/demand/disease, manage stress, strengthen EAP, re-engineer, reorganize, devise incentives, penalize, train, and cut (down size).

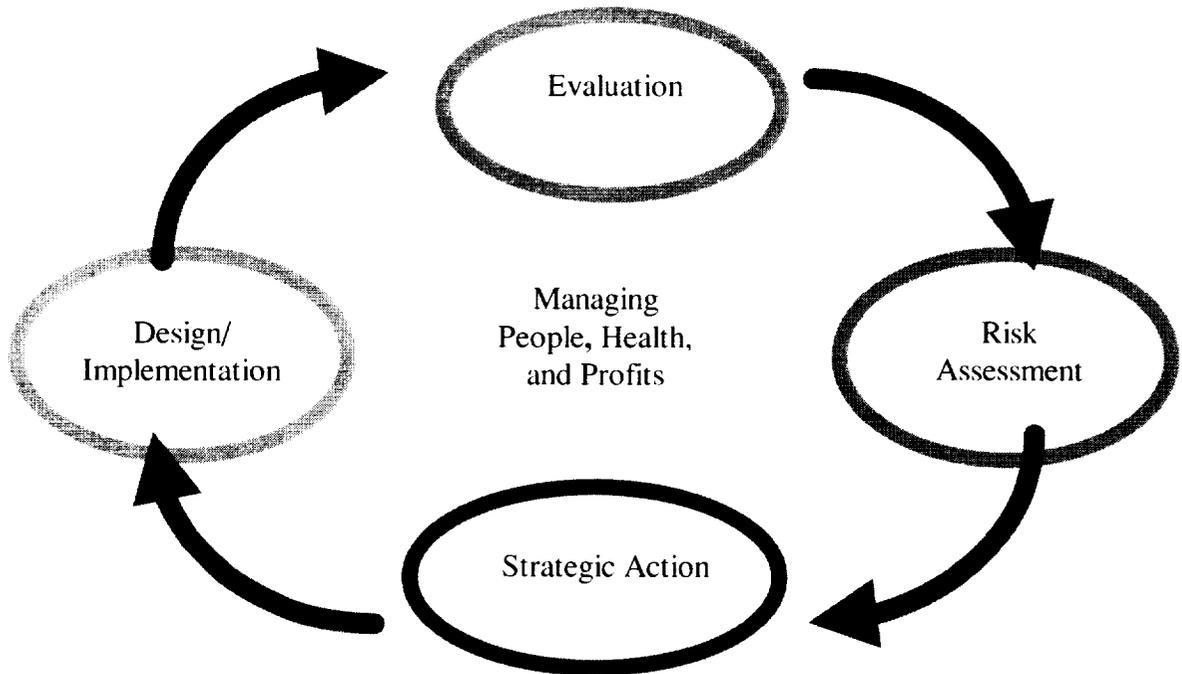
Thus, the common approach is to invoke individual program management, with a picture resembling scattered pieces of a puzzle.



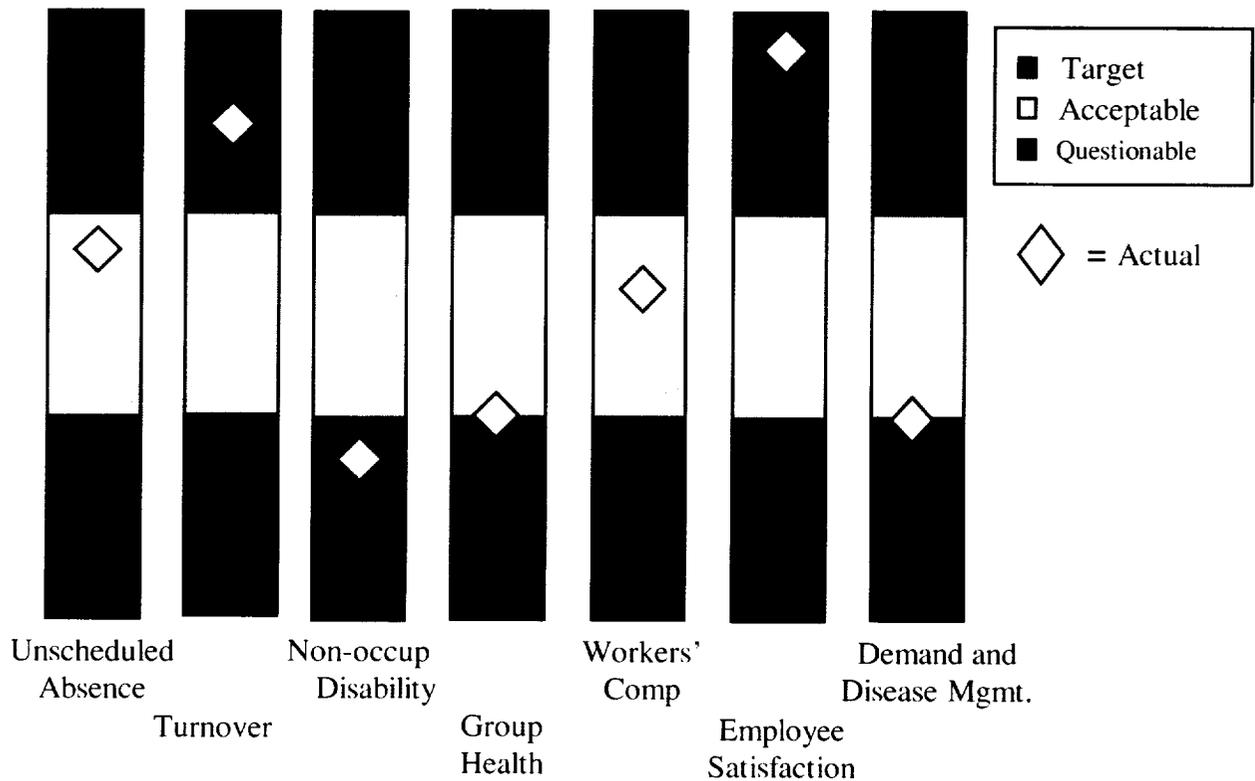
What we should try to achieve is assembly of the pieces of the puzzle together in a synergistic fashion. This would move toward integration through cross-program views.



## Health and Productivity Management Approach



## A Method to Quantify Program Risks



## Health & Productivity Management Benchmarking Partnership

- APQC
- The MEDSTAT Group
- Consortium Survey Participants:
 

Ameritech Corporation	Motorola, Inc.
Applied Materials, Inc.	Nationwide Insurance Co.
Bechtel Corporation	Pacific Bell
Citibank, N.A	Public Service Electric & Gas Co.
Cooper Industries, Inc.	The Travelers Group
Delta Air Lines, Inc.	Union Pacific Railroad
Federal Express Corporation	University Health Systems
Honda of America	

### APQC/MEDSTAT HPM Benchmarking Consortium Study

#### Phase I - Quantitative Study - Focus Areas

1. Nature of the organization
2. Employee population and demographics
3. Group health
4. Absenteeism
5. Non-occupational disability
6. Workers' compensation
7. Health, demand & disease management programs
8. Employee attitudes
9. Employment costs and turnover
10. Productivity

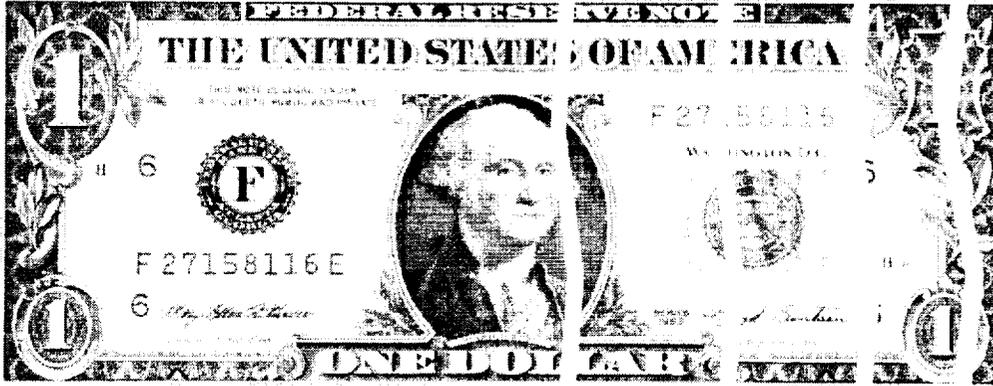
### Profile of Consortium Survey Participants: Median HPM Costs per Employee



Group Health	Unscheduled Absence	Turnover	Non-Occ. Disability	WC
\$4,785	\$1143	\$1070	\$424	\$227
63%	15%	14%	5%	3%

The median HPM Cost across categories is \$7,649 per employee.

## Profile of Consortium Survey Participants: Median HPM Opportunity Per Employee



Group Health	Unscheduled	Turnover	Non-Occ.	WC
\$1,262	Absence	\$427	Disability	\$76
53%	\$446	18%	\$187	3%
	19%		8%	

The median HPM Opportunity across categories is \$2,398 per employee, a 31% reduction in total per employee HPM Costs.

### Total Absence Costs

Per Employee	Group Health	Non Occupational Disability	Workers' Compensation	Unscheduled Absence	Turn-over	Total
Annual Absence Days		5.84	1.40	5.74		12.98
Indirect Productivity and Profit Loss		\$1,624	\$389	\$1,595		\$3,608
Direct Program Costs	\$4,785	\$424	\$227	\$1,143	\$1,070	\$7,649
Total Costs	\$4,785	\$2,048	\$616	\$2,738	\$1,070	\$11,257

Note: On average, employees are away from work an additional 20.67 days for scheduled absences at a total cost of \$5,743 per employee.

## Annual “Down Time” Reported by Survey Participants (In Days)

Lost Productivity	1995	1998
Missed work days due to:		
• Stress	1.1	1.5
• Personal matters	1.4	1.9
• Caring for sick child	1.2	1.4
• No available child care	0.4	0.5
• Caring for elderly dependents	<u>0.6</u>	<u>0.8</u>
<b>Subtotal</b>	4.7	6.1
Time spent as work on personal matters	<u>4.4</u>	<u>5.4</u>
<b>Subtotal</b>	9.1	11.5
Missed work due to other employee sick time	<u>4.5</u>	<u>3.6</u>
<b>Total</b>	13.6	15.1

Source: AON Consulting, America@Work Survey, 1998

### *HPM Total Compensation*

#### **Model 1**

Total Compensation = [Wages, Other Labor Costs (OLC), Fringe Benefits]

#### **Model 2**

- Wages = \$
- Other Labor Costs = (Absenteeism, Disability, Turnover, Low On-the-Job Productivity, Recruitment/Retention, Training, Employee Morale, Organizational Health, ...)
- Fringe Benefits - Group Health (Plan Design), STD/LTD, Workers' Compensation, Work-Life, Savings Plan

#### **Model 3**

Other Confounding Factors:

- Demographics
- Health status
- Environment
- Working conditions
- Gross economic and societal influences
- Belief system

## **APQC/MEDSTAT HPM Benchmarking Consortium Study**

### **Phase II - Qualitative Study - Focus Areas**

- Organizational enablers
- Implementation strategy
- Evaluation methods

### **Best Practice Companies: Site Visits**

- Coors, Golden, CO
- Texas Instruments, Dallas, TX
- Union Pacific Railroad, Omaha, NE
- Steelcase, Inc., Grand Rapids, MI
- General Electric, Fairfield, CT

### **Other Best Practice Companies:**

- Champion, International, Stamford, CT
- Pacific Bell, San Ramon, CA

### **Phase II Results: HPM Foundations for Success**

1. Alignment between HPM and overall business strategy
2. Interdisciplinary team focus
3. Champion(s)
4. Senior management is engaged
5. Prevention, health promotion, occupational health are drivers
6. Emphasis on quality of life improvement, not just cost cutting
7. Data, measurement, evaluation and ROI studies are critical
8. Communication is constant and directed at all levels
9. Constant need to improve and learn from others
10. Fun

### **The Future**

- Update Phase I data with 1998 results
- Potential focus areas for Phase II: **Key measures of HPM**
- Develop and test a predictive **Integrated Model of HPM**

### **Summary Comments**

- The work world is changing rapidly.
- Organizations are focused on improving: Profitability, Productivity, Employee health.
- HR's role has evolved from being a cost center to being a catalyst for change.
- Individualized, tunnel vision, independent and uncoordinated approaches no longer make sense.
- A comprehensive integrative model of HPM needs to consider individual, organizational and societal influences on health and productivity.
- You can't manage what you can't measure.

## **SESSION IV    Benchmarking Unlimited**

Session Chair: **Emmett B. Ferguson, Jr., MD, MPH**  
Manager, NASA Occupational Health Program Support Office  
The Bionetics Corporation, Kennedy Space Center



Guest Speaker **Susan L. Lemons, MS, MBA**  
Vice President, Quality Management and Reengineering  
Johnson & Johnson



**Johnson & Johnson: Benchmarking for Excellence,  
Corporate Health Achievement Award Winner**

Guest Speaker **Fikry W. Isaac, MD**  
Director, Occupational Medicine, Health & Wellness  
Johnson & Johnson



**An Integrated Shared Services Model**

Guest Speaker **Marilynn E. Bell, Doctorate in English**  
Wordsmith Training and Consulting



**Excellence Through Communications—  
Clear Oral Presentations**

**Excellence Through Communications—  
Clear Technical Writing**

**Johnson & Johnson**  
**Benchmarking for Excellence**  
**Corporate Health Achievement Award Winner**

**Susan L. Lemons**

Vice President, Quality Management & Reengineering  
Johnson & Johnson

**Fikry W. Isaac, MD**

Director, Occupational Medicine, Health & Wellness  
Johnson & Johnson

*Editor's Note:*

The 1997 NASA Occupational Health Conference theme was "Achieving Excellence in Occupational Health." The Corporate Health Achievement Award, sponsored by the American College of Occupational and Environmental Health (ACOEM) was described. Winners of that prestigious award were featured and representatives described their company's Occupational Health Programs that were considered outstanding. This year (1998) Johnson and Johnson is a Corporate Health Achievement Award winner. Much of the credit for developing their "World-Class" programs is attributed to "Benchmarking."

Susan Lemons, as Vice President for Quality Management and Reengineering for Johnson & Johnson, is an authority on the process and responsible for the ongoing effort of J&J's Signature of Quality program—the name given to the continuous improvement and Total Quality Management programs in the Company. She defines "Benchmarking" as the concept of searching for the "best" in a particular category in order to compare performance.

## **Overview of Johnson & Johnson**

### **Background**

- Founded in 1886 in New Brunswick, New Jersey
- The largest and most comprehensive health care company in the world
- 90,000+ employees
- Over 180+ decentralized operating companies
- Selling products in 175 countries
- Facilities in over 50 countries

### **A Diversified Health Care Company**

J&J is the world's largest and most comprehensive manufacturer of health care products serving the consumer, pharmaceutical, diagnostics and professional markets. The corporation achieved this leadership by concentrating on a unique form of decentralized management, following the ethical principles embodied in our Credo and managing the business for the long term.

## **Our Credo**

We believe our first responsibility is to the **doctors, nurses and patients, to mothers and fathers and all others who use our products and services.** In meeting their needs everything we do must be of high quality. We must constantly strive to reduce our costs in order to maintain reasonable prices. Customers' orders must be serviced promptly and accurately. Our suppliers and distributors must have an opportunity to make a fair profit.

We are responsible to our **employees**, the men and women who work with us throughout the world. Everyone must be considered as an individual. We must respect their dignity and recognize their merit. They must have a sense of security in their jobs. Compensation must be fair and adequate, and working conditions clean, orderly and safe. We must be mindful of ways to help our employees fulfill their family responsibilities. Employees must feel free to make suggestions and complaints. There must be equal opportunity for employment, development, and advancement for those qualified. We must provide competent management and their actions must be just and ethical.

We are responsible to the **communities** in which we live and work and to the world community as well. We must be good citizens - support good works and charities and bear our fair share of taxes. We must encourage civic improvements and better health and education. We must maintain in good order the property we are privileged to use, protecting the environment and natural resources.

Our final responsibility is to our **stockholders.** Business must make a sound profit. We must experiment with new ideas. Research must be carried on, innovative programs developed and mistakes paid for. New equipment must be purchased, new facilities provided and new products launched. Reserves must be created to provide for adverse times. When we operate according to these principles, the stockholders should realize a fair return.

## **THE SIGNATURE OF QUALITY<sup>®</sup> (SOQ) (J&J's TQM)**

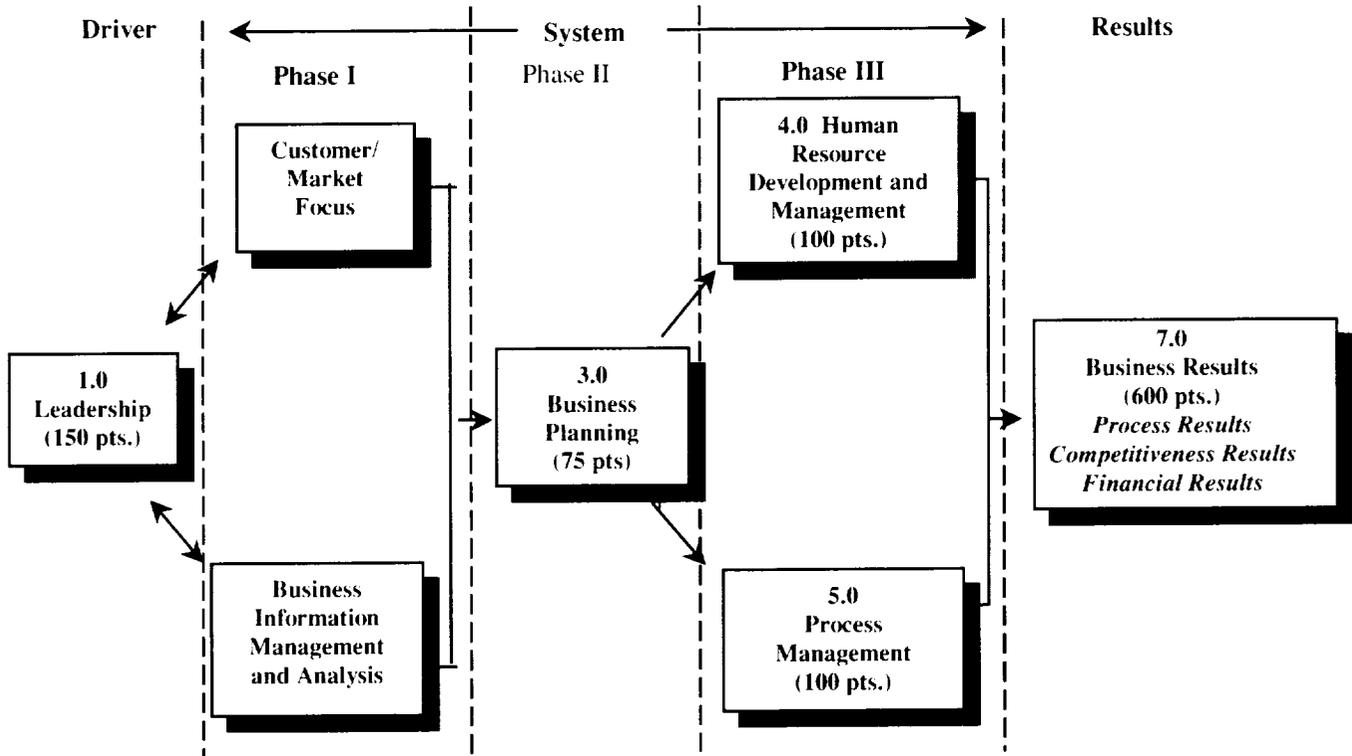
***Assessment***  
***-Self***  
***-3rd Party***

***Improvement***  
***- Strategic***  
***- Process***

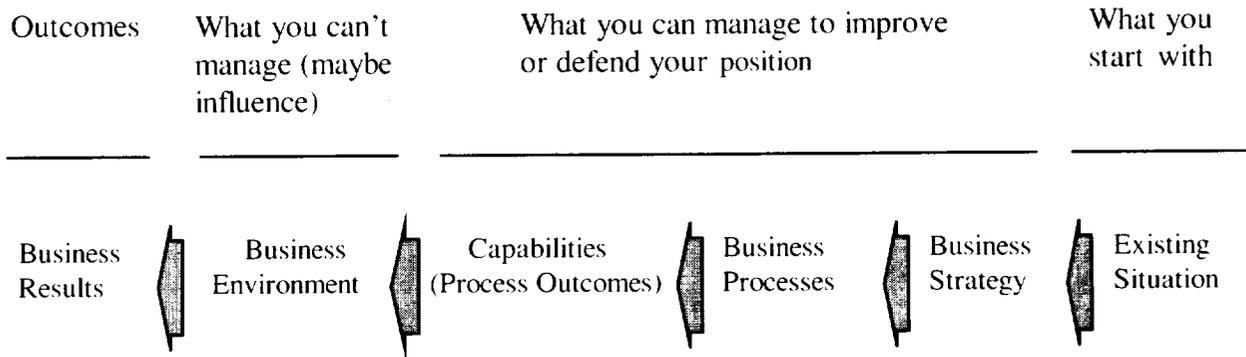
***Recognition***  
***- Awards***  
***- Leadership***

# THE SIGNATURE OF QUALITY<sup>®</sup>

## Competitiveness Assessment Management



### SOQ Competitiveness Model



**How the Benchmarking relates to the SOQ Model?**

## **Benchmarking Defined**

Benchmarking the term comes from the Civil Engineering Practices of “marking on a bench” a starting point from which to measure other elevations. It has changed meanings over time, but is usually *always a point of reference*. The following definitions are those consistent within the “Total Quality Community”.

**Benchmarking: The concept of searching for the “best” in a particular category in order to compare performance.**

## **Types of Benchmarking**

- Competitive Benchmarking (sometimes called Enterprise Benchmarking)
- Functional Benchmarking
- Process Benchmarking (The method usually defined by “experts” on the subject)

### **Competitive Benchmarking:**

Looking at performance parameters within the same industry and comparing competitive performance. These are usually in areas of market share, financial performance, or other similar method.

#### Purpose:

The purpose of this type of benchmarking is to determine how large a *gap exists between the enterprise and the competition in the same industry*.

#### Use:

This method is often a good way to *develop a case for action* for change at the enterprise level.

### **Functional Benchmarking**

Looking at performance parameters within any industry (inside or outside your own) in the functional area (such as finance, HR, engineering, etc.) and comparing information about performance. This usually includes such things as “number of people in the function, how they organize, what they do, how the organizations measure them, etc.”

#### Purpose:

This process is used to understand *how other organizations utilize functional expertise* and compare how they are organized.

#### Use:

This method is often used to support *rethinking of the “areas of expertise” that a particular function* can do. It can also provide a case for action on process benchmarking.

## Process Benchmarking

Looking at process performance parameters in any industry and determining best-in-class. This is a systematic process to determine who is likely to be the best-in-class and then determining a formal method to view and share information about the process.

### Purpose:

The purpose of this type of benchmarking is to determine **how** organizations achieve outstanding performance in the process.

### Use:

This method is best used to break paradigms and support process improvement and process redesign efforts.

## The Process of Process Management

- Select the Process...high impact to business need, determine purpose of process is meeting the strategic objectives of the business
- Select Process Owner...Process Lead to act on behalf of the leadership to improve/management he process
- Select a Process Leader...someone to develop the team and the measures
- Select the Process Team...cross functional
- Scope the Process....this may change several times, but start with one
- Baseline the Process...determine current performance
- **Determine Process Potential/Best Historical or best in industry (Benchmark)**
- Determine "Customer" Requirement
- Identify Barriers and make appropriate priority decisions to remove...manage the Process

### How to Select

Current Performance	High	<b>Remove resources to create capacity</b>	
	Low		<b>Improve for competitive advantage</b>
		Low	High

Strategically Important/Market Driver

## **The Code of Conduct**

1. Process benchmarking requires that the company doing the benchmarking understand their own process and its performance **before** they contact the company they wish to Benchmark.
2. Usually the people who “own” the process are on the benchmarking trip and are responsible for improving the overall performance of their process. (Cross functional & cross level)
3. This is resource intensive and can build (or reduce) business relationships with organizations and as such should *not be done on a “whim”*.

## **What is being offered in the market place?**

- Benchmarking clearinghouses
- Benchmarking consortiums
- Individually sponsored benchmarking opportunities
- Industry sponsored benchmarking opportunities
- Consultant sponsored benchmarking

# **An Integrated Shared Services Model**

**Fikry W. Isaac, MD**

Director, Occupational Medicine, Health & Wellness  
Johnson & Johnson

## *Editor's Note:*

Johnson & Johnson embarked on a study of their Health and Wellness services to benchmark similar programs and develop an improvement plan. The effort resulted in actions to integrate a number of related support services throughout the Corporation. The comprehensive employee health services, employee assistance programs and wellness programs were targeted for the reorganization. The resulting organization provides unified leadership standardized procedures including accountability, and cost assessments. Prevention and education were priorities in the new organization, but direct input into employee health benefits was an important part of the integrated services.

The following information describes the extensive service delivery model and provides details of the successful implementation of the integrated services plan.

## **Shared Services Concept**

- Shared Services concept developed 9/93
- Health, Wellness and EAP totally integrated through J&J Health & Wellness (4/95)
- New Strategy

## **Health & Wellness Key Features**

- Focus on Prevention and Education
- Deliver Risk-Specific Interventions
- Integrate Functions
- Reduce Cost of Delivery
- Introduce Health Benefits Linkage

## **Health & Wellness Regions**

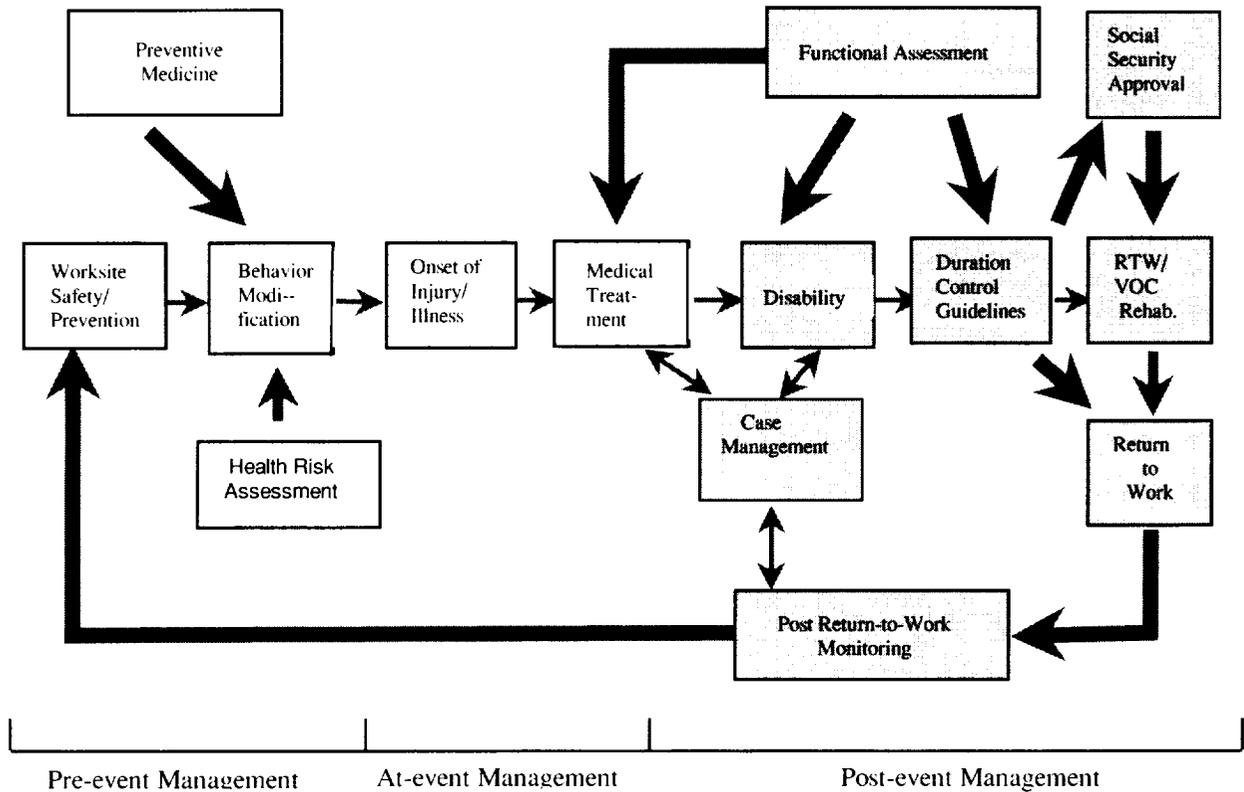
Region I	New Jersey	12,000 employees
Region II	Northeastern	10,000 employees
Region III	Western	8,000 employees
Region IV	Southeastern, Puerto Rico	10,000 employees

## **Health & Wellness Mission**

Health & Wellness provides state-of-the-art Disability Management, Employee Assistance, Occupational Medicine, and Wellness services to Johnson & Johnson employees through an integrated, cost-effective approach that meets our customers' requirements and emphasizes prevention and education.

## Service Delivery Model

### Integrated Health, Wellness & Disability Management: An Ongoing, Proactive Process



### Service Delivery Model—Pre-Event Management

- Preventive Health Services and Screening
- Health Education & Self-Responsibility
- Health & Safety Education/Training
- **Pre-Placement Assessment/Job Specific Examinations**
- International Travel Program
- Ergonomic Assessment
- Job Conditioning
- Workplace Drug & Alcohol Testing & Awareness Training Program
- Assessment & Referrals
- Key Resource and Supervisory Training Program
- Supporting a Non-Violent Workplace Training Program
- Management Consultations

## **Service Delivery Model—At-Event Management**

- Emergency Care
- Occupational Injury/Illness Care
- Limited Non-Occupational Care
- Over-the-Counter Medications Vending Program
- Medical Case Management
- Alternate/Modified Duty Assessment
- **Medical Surveillance & Regulatory Compliance**
- Health Risk Management Programs
- Critical Incident Response
- Counseling & Referrals
- Substance Abuse Management & Referrals
- Management Consultations

## **Service Delivery Model—Post-Event Management**

- Functional Assessments
- **Return to Wellness Program**
- Substance Abuse – Post Rehab Monitoring
- Critical Incident Debriefing
- Management Consultations
- Alternate/Modified Duty Monitoring
- Service Delivery, outcome measurement.
- Record-keeping & Trend Analysis

## **Health Surveillance**

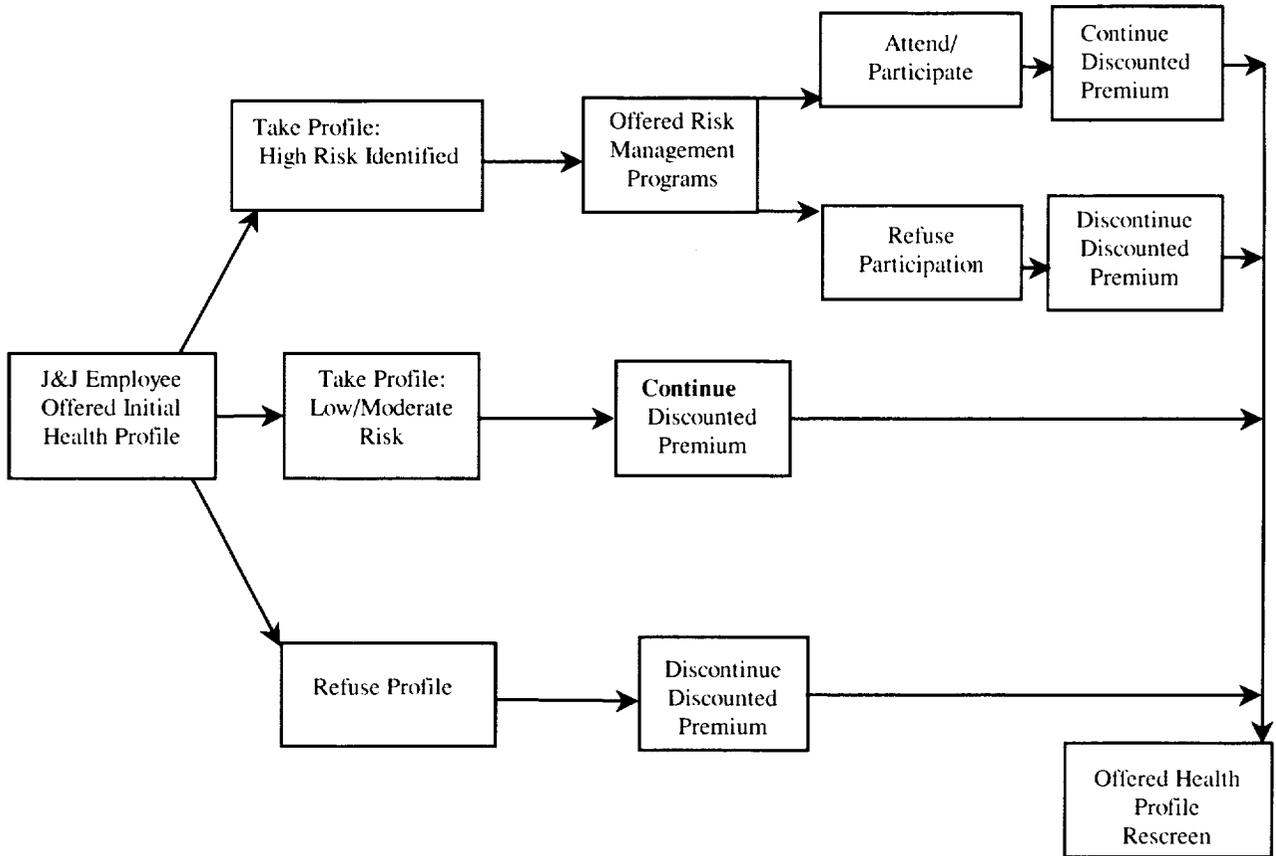
### **Health Surveillance Programs**

“Many screening tests have been offered annually based on no better logic than the fact that the earth circles the sun every year.

The frequency of screening depends on the natural history of the condition - how long it takes to develop from first detectability to signs or symptoms - not on astronomy.”

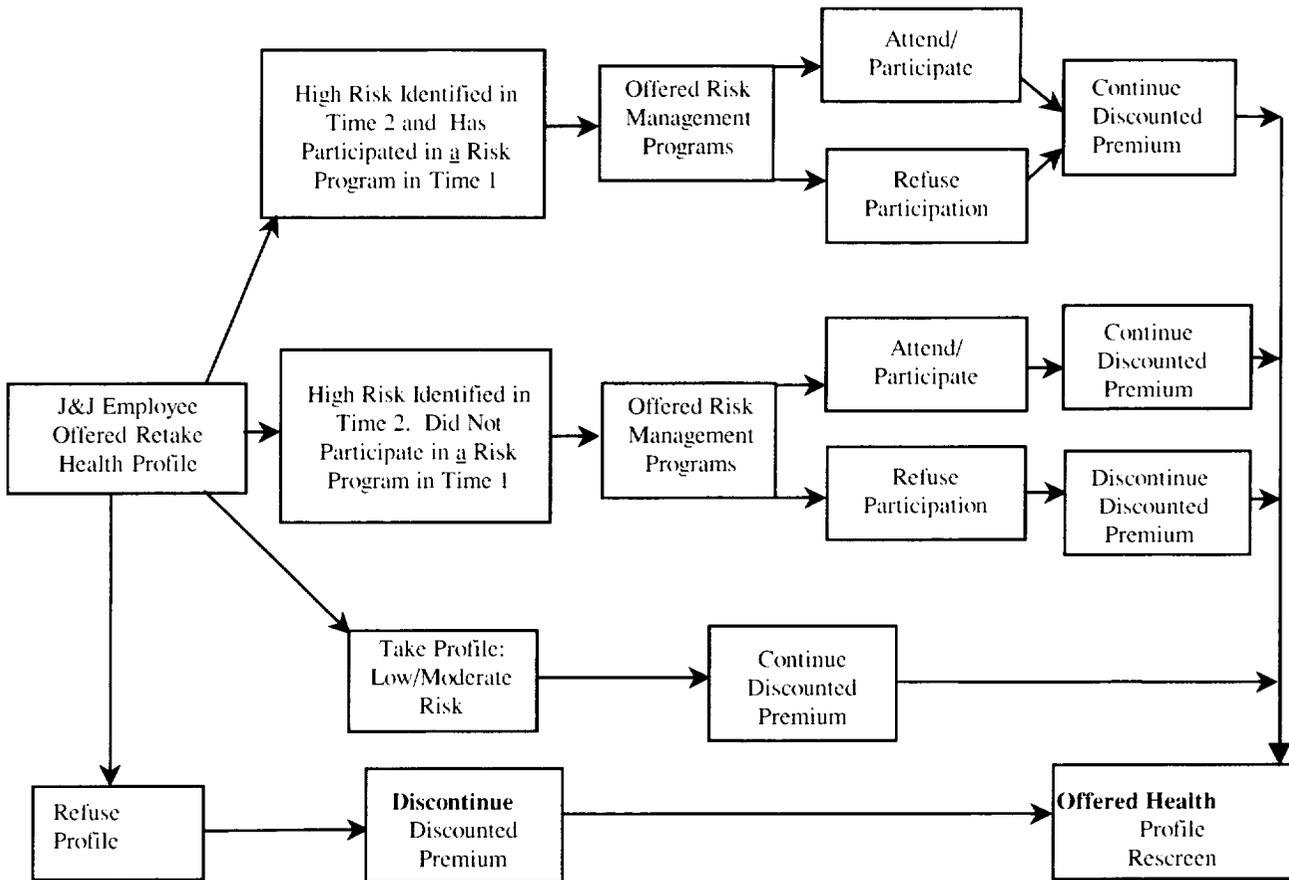
- Desired Outcomes:
  - Standardization
  - Cost effectiveness
  - Elimination of non-value added activities
  - Integration of Medical/Safety and IH activities
- Review Process:
  - Current J&J programs
  - Standards, regulations and guidelines
  - Non - J&J programs
  - Current medical and scientific information

### Health Benefits Linkage - Time I



Objective: Encourage all employees to participate in a health-risk assessment and, if identified as high risk, participate in high risk management lifestyle programs.

## Health Benefits Linkage - Time II



### Health Profile Participation (July 1995 - December 1997)

- 31,000 J&J Employees Health Profiled
- 90% Average Participation ("Choices" Eligible)

### ERGO Worldwide Ergonomic Initiative

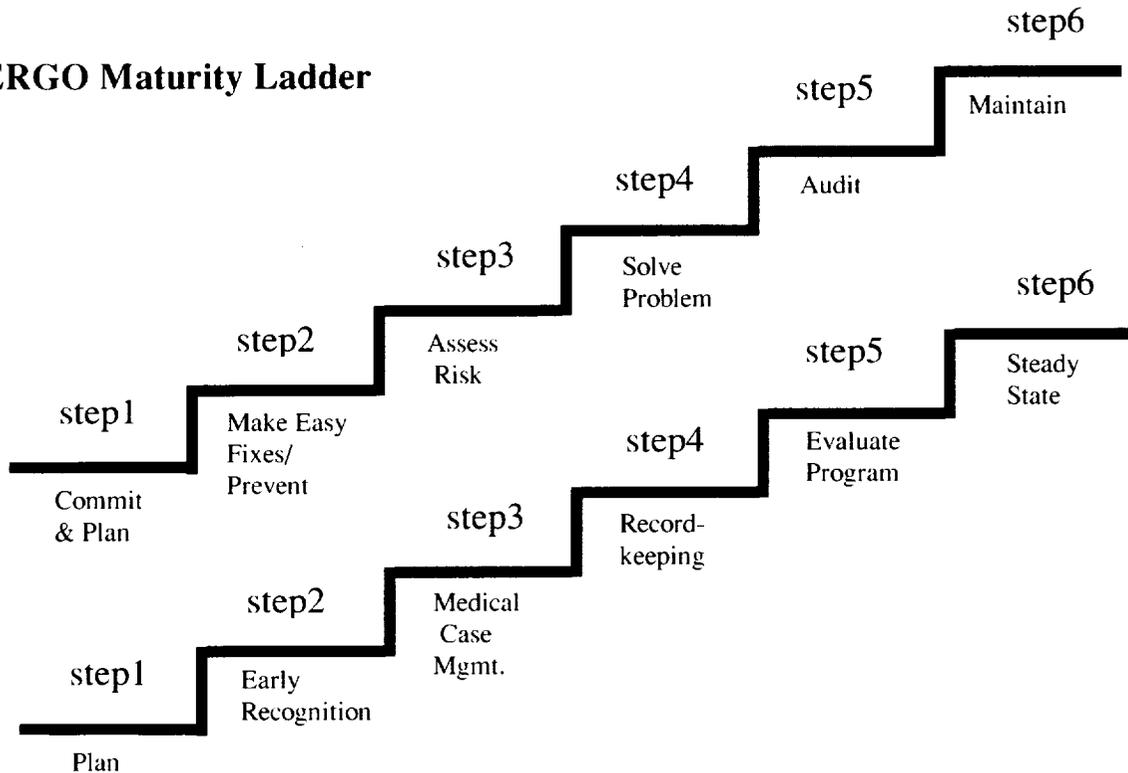
A successful medical ergonomics process includes:

- Ergonomic related injury/illness early detection system
- Association of diagnosed injury/illness with risk factors
- Treatment and referral network
- Modified duty
- Job conditioning
- Systematic monitoring and follow up
- Appropriate record-keeping

## ERGO Proactive vs. Reactive

- A Culturally Driven Program
- Partnership Between Health & Wellness and Safety
- Ergo Maturity Process
- Medical Guide for the Health Professional

## ERGO Maturity Ladder

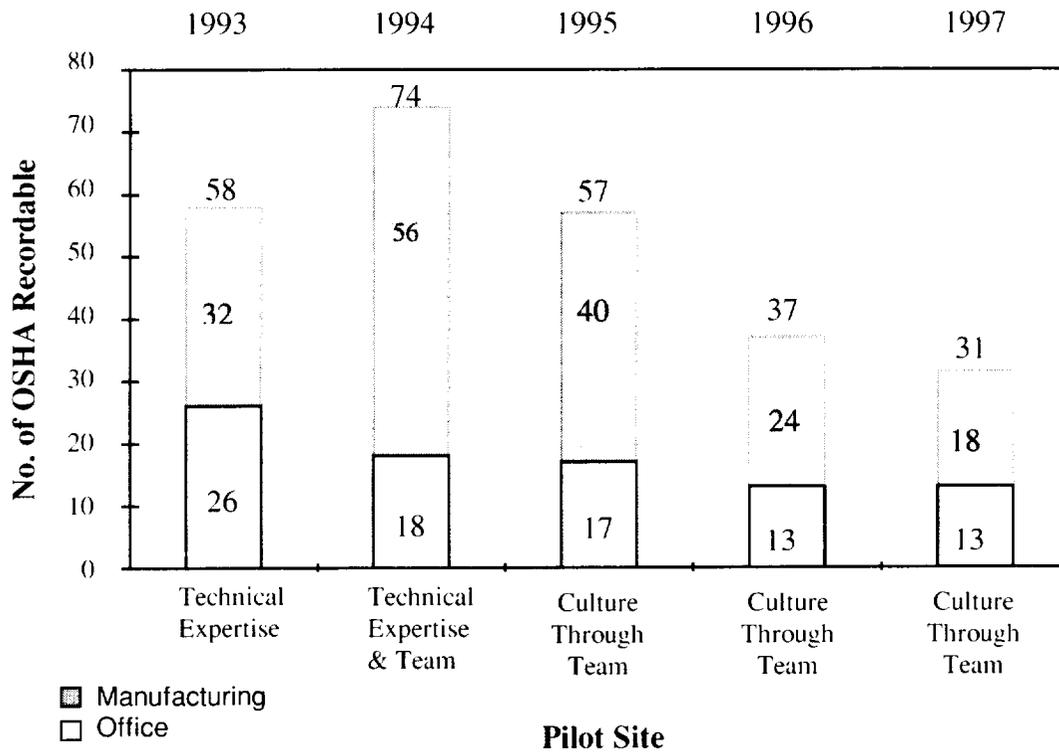


## ERGO Medical Maturity Ladder

## ERGO Medical Guide for the Health Professional

- Overview of ERGO Worldwide Initiative
- Overview of Medical Ergonomic Process
- Health Surveillance for Ergonomics
- Common Conditions of the Neck and Upper Extremity
- Medical Case Management Protocols
- Modified/Alternate Duty Policy
- Job Conditioning
- Record-keeping Guidelines
- Program Evaluation
- References & Resources

## Culturally Driven ERGO Program



## Return To Wellness (RTW)

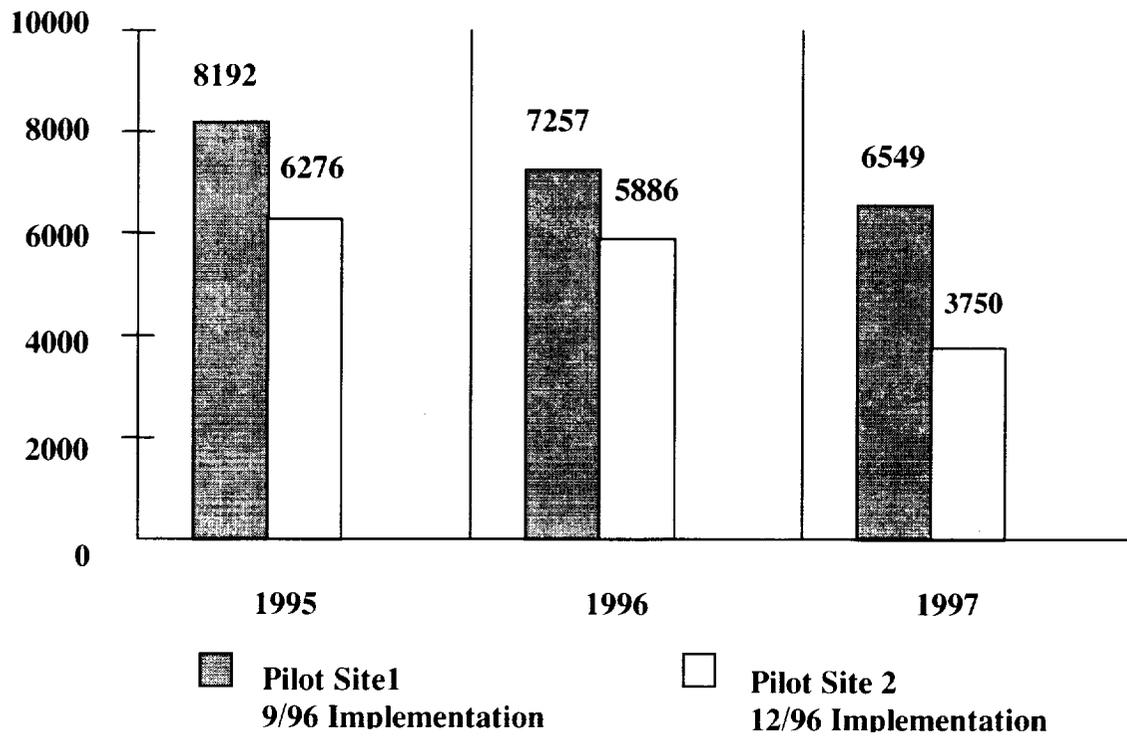
### Disability Management Objectives

- Integrate STD, LTD, WC Process
- Healthier Workforce
- Reduce Costs
- Reduce Absence
- Enhance Morale
- Achieve Compliance

### Components of RTW Program

- Early Identification and Intervention
- Involvement of Key Personnel
- Case Management
- Work Modification
- Investment in Prevention

### Total STD Calendar Days Out



### Future Direction

- Worldwide Health & Wellness
- Total Health Management

# **Excellence Through Communications— Clear Oral Presentations**

**Dr. Marilyn E. Bell**  
Wordsmiths Training and Consulting

## **Introduction**

Public speaking is a universal fear that most people will admit to. In fact, researchers say that public speaking is the number one fear of people in this country.

Fear is an immobilizing emotional state that prevents us from meeting challenges effectively. The inaction caused by fear sets into motion the very things that we are anxious about. It focuses our attention and energy on exactly what we do not want to happen.

The fears that wreck the poise and confidence of presenters are usually associated with embarrassment, inability to control important elements of the presentation, negative audience reactions, or with the potential for failure. Concentrating on these things will energize and activate “Murphy’s Law” every time.

Experienced presenters are not deterred by negative feelings that they all experience. The information and exercises in this workbook contain ideas for reducing fears, anxieties, nervousness, and stress as your presentation approaches.

## **Managing Presentation Day Nervousness**

If you find yourself tense and nervous as the day of your presentation approaches, try this exercise in total body relaxation for 10-20 minutes.

1. Sit comfortable in a chair with your feet flat on the floor.
2. Slowly inhale, filling your lungs from bottom to top. (Your abdomen should expand as you inhale.)
3. Exhale slowly as though you were sighing. Push the air out using your diaphragm muscles. Repeat three times.
4. Gently drop your eyelids closed. Continue breathing deeply.
5. In your mind’s eye, focus your attention on the top of your head. Silently speak the word “Relax”. Imagine that each inhaled breath draws relaxation into the area of focus and that each exhaled breath releases all the accumulated tension in that same area.
6. Continue sending relaxation to each area of the body: the head, face, ears, neck, shoulders, arms, elbows, hands, fingers, chest, back, abdomen, hips, thighs, knees, legs, ankles, feet and toes.
7. When your entire body is relaxed, spend a few extra moments continuing deep breathing and enjoying the sensation of total body relaxation.

For some people, the best way to reduce tension and distress is to get moving. Non-competitive, aerobic exercise is an excellent way to cope with nervousness and body tension. The exercise most often recommended by health and fitness experts is walking. Walking is a great way to combine a semi-meditative mental/emotional state with overall body toning and relaxation. A 30-minute walk the evening or morning before your presentation will provide long-lasting benefit.

### **Tips for Reducing Stress and Nervousness**

- Make lists
- Organize materials
- Practice, practice, practice
- Visualize what you want to happen
- Ease the pressures

### **Defining Your Purpose**

- What are your reasons for making this presentation?
- What do you hope to accomplish? What action do you want to happen after your presentation?
- Specify your objective in approximately 25 words.

### **Content Considerations**

#### **The Heart of Your presentation**

What are the five most important things you want to say to the audience?

#### **Other Considerations**

- Opening With a Bang – How will you get their attention?
- Building the Body – How will you back up what you have to say? How will you keep them alert and interested?
- Summarizing and Concluding – What do you want them to remember? What do you want them to understand better? What actions do you want them to take following the presentation?

### **Organizing Your Presentation**

#### **Gathering Materials**

- List all materials you will need to organize and write the opening, body, and conclusion of your presentation.
- List all the clerical and technical support you will need to prepare and deliver your presentation.
- List all the equipment that you plan to use for your presentation.

## Speaking with Confidence

One of the best ways to gain confidence in your speaking abilities is to record your voice on a tape recorder. Record 5-10 minutes of your presentation. Listen carefully during playback and rate yourself (1,2 or 3) on each item below.

1 = needs work

2 = make minor adjustments

3 = very good

Rating			Comments
1	2	3	Clear, unmuffled, unslurred words
1	2	3	Proper pronunciation
1	2	3	Clear, crisp word endings
1	2	3	Conversational tone
1	2	3	Volume not too loud or too soft
1	2	3	Talking at right pace
1	2	3	Speaking with conviction/authority
1	2	3	Little or no use of <i>filler</i> words such as <i>umm</i> , <i>uh</i> , and <i>uh</i> , <i>you know</i> , <i>er</i> .
1	2	3	Speaking with enthusiasm
1	2	3	More sound than air being projected
1	2	3	Inflection changes to indicate emphasis
1	2	3	Pauses in the right places
1	2	3	Short sentence lengths
1	2	3	Minimal use of unexplained acronyms and abbreviations

*Option: Give a copy of this rating form to a friend whose speaking ability you admire. Ask the friend to listen to your tape and rate your delivery*

## **Projecting Energy and Enthusiasm**

- Look in the mirror and treat yourself to a cheery pep talk or a rah-rah song before making your presentation. “Haaappy am I today! This is my happy day.”
- Smiling while you speak always adds enthusiasm and color to your voice.
- Try to reward your audience with frequent eye contact to add a personal touch.
- Movement of your body through appropriate gestures, postures, and positioning projects energy and vitality. Use natural gestures to enhance or underscore your words.
- Lean forward occasionally to reach out to your audience.
- Move around occasionally. Step away from the podium, lectern or front and center of the room. This will help the audience to move their eyes and head and avoid trance-like staring at one position.
- Vary the volume, length of pauses, and speed of delivery.
- Use anecdotes, examples and analogies.
- Use good voice projection. Learn to speak from the diaphragm. Practice sending your voice to different points in the room without raising your volume. Place your hand on your abdomen and try to feel the vibration of your voice resonating deeper into the diaphragm area.
- Energize the audience by using the *call and response* technique: Give the audience a statement with a word or phrase you want them to repeat. Then repeat the statement and rally them to respond with the declarative word or phrase.

# Excellence Through Communications— Clear Technical Writing

**Dr. Marilynn E. Bell**  
Wordsmiths Training and Consulting

## **Remember the Reader**

The secret of effective, efficient writing is to remember the reader. This key to strong writing is especially important to messages that require action from the reader. To be efficient and to inspire efficiency in others, a writer needs to learn these four truths:

1. **Readers are busy.** Most professional people are pressed for time. One cause of this stress is their sense that they have too much to read and too much to do. Your message must not sound imposing or unreasonable. Even good news will be resented if it entails heavy reading, and sounds as though preparing for the “blessing” will be more work.
2. **Readers are self-involved.** Like all human beings, readers are concerned with their own projects, problems, feelings, and pressing considerations. They must be told immediately how the message relates to their needs and their concerns. The writer’s first responsibility is to involve the reader. Traditionally, technical writers have been so involved with the content that they have not thought about the reader’s needs.
3. **Readers are goal-oriented.** A rule of the psyche is that human beings need something on which to focus their energies. This goal helps them to develop a worthwhile, productive pattern of behavior. In an organization, a number of goals are mutual (“satisfy the customer,” “stay with the master timing schedule,” “eliminate nonconformance”). Writers can use this common ground of shared goals to help create defect-free writing.
4. **Readers are unequal.** Not all readers have the same training, skills, experience, or interests. These different backgrounds create different assumptions, values, associations, attitudes, and – most important – expectations. Not all readers will understand or immediately recognize acronyms or jargon.

A writer may be said to “talk on paper,” to create a “voice,” whether intending to do so or not. The tone of that voice must be appropriate.

### **Defective Tones**

brash  
whiny

arrogant  
negative

critical  
pessimistic

anxious  
weak

## Appropriate Tones

authoritative	thoughtful	energetic	reasonable
understanding	knowledgeable	cautious	forceful
helpful	prudent	rational	sincere
team player	cooperative	directive	candid

## Summit Organization Plan

In a pyramid, the **main message** (Why are you writing me?) has the greatest value and is included in the upper fourth of the pyramid. The **details** (What is this memo about?) have intermediate value and are in the middle half, while the **closing** is shown at the bottom of the pyramid.

## Questions to Answer as You Write

Answers to these questions will help you to understand and satisfy the needs and requirements of the readers.

1. Who is your target audience? Are you writing for an individual or a group? Will the message be copied and circulated?
2. Can you define or pinpoint key interests and needs? What does the reader want or need to hear from you?
3. What does the reader already know? What kinds of questions will the reader ask?
4. Does the reader want a simple statement or a thorough detailed explanation? (How detailed or how technical?)
5. If your audience is a multiple one, what constraints are imposed on your language, your message, and your method?
6. How will the reader use the information in the message?
7. Are groups outside the stated audience likely to read your message (legal, media, consumer)?
8. Are you writing for another person's signature: Do you know what the signer expects? Have you considered stylistic preferences (first person, vocabulary, active/passive verbs)?
9. Have you considered both the human and the business objectives?

## **Changes in Organization and Content**

Exercise: Using the Summit Organization Plan, suggest changes in organization and content. Look for ways to improve the writer's style.

### **Plant Site Visit**

**Re: Environmental Resources, Inc.  
Proposal for Processing Wastewater Treatment**

This was truly an opportunity to see scheduling and manufacturing of parts. The visit developed for me an understanding of the manufacturing process. This meeting was brief but sufficient for understanding the following:

1. Augmented awareness of vendor's responsibilities. By going through active and fictional problems, an exchange of ideals and future commitments to each other was made to resolve and, if possible, terminate any problems.
2. An attempt was made also to improve interrelations by way of discussion. One commitment was to schedule a plant site visit with the Albaro plant on Wednesday, December 7, 1994 at 11:30 AM. Our commitment is to remain active and communicate until the best method can be applied.
3. Exposure to the day-to-day operations of the vendor's plant, via the plant tour which was given, was extremely informative.

In summation of the visit to Alabaro, David Johnson and myself were properly greeted and introduced to personnel in all areas. We developed interrelations to work together to assure better working relations. We were shown all operations of productions and work areas. We actually observed the way all parts were made and assembled. In my view, this experience has enlightened me in the field of manufacturing goods. This method of site visits, in attempting to identify and resolve problems, is by far the best.

## **Ten Tips for Clear, Concise Writing**

1. Get to the point quickly.
2. Correct “there is” and “it is” openers unless they add emphasis or variety.
3. Bring the “verb idea” up front. Watch for wordy uses of the verbs “to be,” “to have,” and “to make.” Be careful of nouns ending in –ment, -ion, -ity, -ness.
4. Cut redundant, non-contributing words and phrases.
5. Employ lists when you wish to make information accessible at a glance. Use phrases or short sentences.
6. Use the command form for instructions and procedures.
7. Use the active voice whenever possible.
8. Cut “to be” verbs (is, was, were) where possible. Replace with strong verbs.
9. Reduce the use of intensifiers (e.g., very, quite, fairly, and completely).
10. Streamline long introductions, background material, and explanations.

### **Advice**

You cannot follow all the rules of economy all the time. Be careful. Never choose brevity at the expense of clarity. Your own sense of what creates lean, easy-to-read writing is the best guide to making your writing concise.

### **Conciseness**

Conciseness deals with the specific words you choose and stresses terminology that is relevant, useful, and meaningful.

On-the-job writing allows for pertinent materials only. Unless information has a true relationship to the particular point you are making, it should be left out. Unrelated and unnecessary phrases distract the reader and should be deleted.

**Avoid these wordy phrases:**

final outcome  
personal opinion  
end result  
period of time

various and sundry  
true and accurate  
final and conclusive  
null and void

due to the fact that  
in light of the fact that  
owing to the fact that  
despite the fact that  
regardless of the fact that

in the nature of  
in the event that  
of the character of

as regards to  
as previously stated  
in reference to  
shall be construed to mean  
concerning the matter of  
as I have told you many times

not to mention  
in the majority of instances  
inasmuch as  
attached please find

enclosed please find  
at this point in time  
needless to say  
consensus of opinion

each individual  
future plans  
past history  
basic and fundamental  
any and all

each and every  
with the result that  
basic essentials

until such time as  
subsequent to  
in the final analysis  
at such time as  
simultaneously with  
first and foremost

## Model for Analysis

To: All Managers and General Supervisors  
From: Alan Trail, Training Coordinator  
Subject: Employee Safety Training

As was made clear in our last meeting, it was agreed that safety would be improved within our organization. In an effort to encourage a more vigorous safety awareness of this particular location, all levels of supervision should be continually alert to unsafe acts and/or conditions. In essence, management must be prepared to "talk safety" every day as circumstances dictate. To assist in achieving a higher degree of safety awareness all supervisors and General Supervisors were requested to evaluate the presentation "The Convincer." It has been recommended that this film be presented to all employees. Accordingly, the attached program has been provided for all departments to schedule employee attendance. As established during the supervisor preview sessions each supervisor is requested to attend with his respective work group. All employees should be strongly encouraged but not forced to attend the sessions. There will be a short introduction of the presentation by a member of the Safety Department. Employee-supervisor discussion should take place after returning to respective departments.

It is to be noted that make-up sessions are provided at the beginning for first and second shift for supervisors who were unable to attend the preview sessions. Make-up sessions for employees are provided and should be scheduled with the Safety Department. Likewise, any requests to change or adjust the attached schedule should be made through the Safety Department.

There are provisions being made to show the presentation in the West Wing cafeteria. 15% of the managers all ready have been notified. Training has made an estimate that the safety program will have a cost of \$3,000 during the coming fiscal year.

Thank you in advance for your continuing efforts in making this location a safer place for all employees to work. If you have any questions or suggestions, please contact James Wilson or myself.

## **What Happened?**

1. I knocked over a man. He admitted that it was his fault, as he had been run over before.
2. I collided with a stationary bus coming the other way.
3. The guy was all over the road. I had to swerve a number of times before I hit him.
4. I had been driving my car for forty years when I fell asleep at the wheel and had an accident.
5. The pedestrian had no idea which way to go, so I ran over him.
6. An invisible car came out of nowhere, struck my vehicle and vanished.
7. I was thrown from my car as it left the road. I was later found in a ditch by some stray cow.
8. If the driver had stopped a few yards behind himself, the accident would not have happened.
9. I saw the slow-moving, sad-faced old gentleman as he bounced off the hood of my car.
10. I bumped into a lamppost that was obscured by a pedestrian. The pedestrian ran for the pavement, but I got him.
11. I was unable to stop in time and my car crashed into the other vehicle. The other driver then left immediately for a vacation with injuries.
12. I pulled away from the side of the road, glanced at my mother-in-law, and headed over the embankment.
13. Coming home, I drove into the wrong house and collided with a tree I don't have.
14. I was on my way to the doctor with rear end trouble when my universal joint gave way, causing me to have an accident.

## KEYNOTE ADDRESS

### Medical Aspects of Space Walking

**Story Musgrave, MD**  
NASA Astronaut, Retired



#### **Introduction**

Dr. Musgrave has acquired extensive experience during a distinguished and impressive career that includes flying as an astronaut on six Shuttle missions, participating in many hours of extravehicular activity, and contributing his myriad talents toward great public service, especially in the area of education. He has a unique perspective as a physician, scientist, engineer, pilot, and scholar. His interests and breadth of knowledge, which astound even the seasoned space enthusiast, have provided the space program an extraordinary scientific and technical expertise.

Dr. Musgrave presented a personal perspective on space flight with particular emphasis on extravehicular activity (EVA or space walking), which was copiously illustrated with photographs from many space missions. His theme was two fold: the exacting and detailed preparations required for successful execution of a mission plan and a cosmic view of mankind's place in the greater scheme of things.

#### **Spaceflight Preparation**

His presentation focused chiefly on the unprecedented STS-61 Shuttle mission in December 1993, to repair the Hubble Space Telescope (HST). The telescope was launched on STS-31R, April 24, 1990, with a serious optical defect in its critical primary mirror. The problem was fully investigated, assessed, and theoretically solved (with the application of correcting optics) on the ground, but the original potential of the HST could not be realized until that correction module had been flown to and installed.

Dr. Musgrave, assumed a leading role in the “Hubble Repair Mission.” He described in detail how the HST repair mission team worked closely in parallel with the scientists, design engineers, and logistics technicians to assure that the crew understood the concept and the magnitude of the task, as well as the near zero tolerances allowed in its performance. The mass of the replacement module demanded physical strength (though weightless, mass is unchanged in space), and its bulk and dimensions required precise alignment and coordinated manipulation. The two-person EVA crew worked explicit and complementary roles. Every maneuver and placement was enacted in ground simulations to perfect the process.

One of the major ground training techniques included using a water immersion facility large enough to construct the full sized Shuttle cargo bay, remote manipulator arm, and the retrieved HST. Working in functional EVA suits, the HST repair crew practiced every movement underwater. They used all their custom designed tools to extract the old equipment module and to reinsert the corrected system. They rehearsed the process in all its intricacies until it was theirs. In space, the actual event was accomplished without a hitch during the five EVA sessions that were necessary to complete the task.

Dr. Musgrave also discussed in some detail the significant role that understanding human physiology, with its limitations and adaptive capabilities in microgravity, played in this monumental effort. Furthermore, the unique methods employed in dealing with the additional harsh aspects of the space environment contributed greatly to this much heralded space mission. Its success has justly earned the respect and admiration of the scientific community, and indeed the world.

And the succeeding five years have proved the value of that corrective design and its complex application. Almost weekly new and unheard of discoveries are reported from findings obtained by the uninhibited, ultra high-resolution capabilities of the HST.

### **Cosmic View**

For the second portion of his presentation, Dr. Musgrave shifted to a yet grander scale, showing fantastic imagery of our earth from space compared with more mundane (though none-the-less pleasing), onsite photographs. Dr. Musgrave convincingly and graphically brought the audience into his personal experience. They viewed through his eyes, felt with his aesthetics, and reasoned from his own cosmic viewpoint. He became the scientist-astronaut-philosopher and evoked in his listeners a sobering concern for this small and delicately balanced orb of life—our earth. He renewed in each of those who were present, the resolve to become more responsible and contributing earth citizens.

*Editor's Note: Dr. G. Wyckliffe Hoffler provided this summary.*

## BREAKOUT SESSIONS

Breakout sessions have always served an important role at the annual Occupational Health Conferences. They contribute to the overall Conference theme, but are not limited to it. They may incorporate invited guest speakers, topical presentations by representatives from the various NASA Centers, reports of current programs and activities, demonstrations of cutting edge technologies, and discussion panels on techniques, issues, problems, solutions, and management strategies. They are organized around disciplinary content, but any session may be attended by any occupation health professional. In fact, this opportunity for cross-fertilization is a major factor that continues to make these breakout sessions practical, popular, and potent in our quest for relevant and rational program agenda. It is perhaps unfortunate that some of these events must occur in parallel sessions, thus requiring selective choice for attendees. However, they all provide useful exchanges. This year's breakout sessions have followed true to tradition, with five well-attended and full fare sessions according to the following.

### SESSION I

#### **Physicians, Industrial Hygienists, and Contracting Officer's Technical Representatives**

Co-Chairs: **Steven G. Brisbin, MS; Emmett B. Ferguson, Jr., MD**  
Kennedy Space Center



### SESSION II

#### **Employee Assistance Program Counselors**

Co-Chairs: **Alan G. Gettleman, MBA; William T. McGuire, MA, CEAP**  
Kennedy Space Center



**SESSION III**

**Nurses**

Chair: **Claire R. Sleboda, RN, BSN, COHN-S**  
Dryden Flight Research Center



**SESSION IV**

**Physicians, Nurses, and Exercise/Fitness Professionals**

Chair: **Emmett B. Ferguson, Jr. MD**  
Kennedy Space Center



**SESSION V**

**Industrial Hygienists**

Chair: **Steven G. Brisbin, MS**  
Kennedy Space Center



## SESSION I

### NASA Occupational Health Program FY98 Self-Assessment

**Steven G. Brisbin, MS**  
Senior Environmental Health Officer  
Kennedy Space Center

#### **Introduction**

The NASA Functional Management Review process requires that each NASA Center conduct self-assessments of each functional area. Self-Assessments were completed in June 1998 and results were presented during this conference session.

#### **Background**

During FY 97 NASA Occupational Health Assessment Team activities, a decision was made to refine the NASA Self-Assessment Process. NASA Centers were involved in the ISO registration process at that time and wanted to use the management systems approach to evaluate their occupational health programs. This approach appeared to be more consistent with NASA's management philosophy and would likely confer status needed by Senior Agency Management for the program.

During FY 98 the Agency Occupational Health Program Office developed a revised self-assessment methodology based on the Occupational Health and Safety Management System developed by the American Industrial Hygiene Association. This process was distributed to NASA Centers in March 1998 and completed in June 1998.

#### **Results**

- Self-assessment survey of NASA Centers was completed in June 1998
- Survey focused on Management System elements rather than traditional compliance oriented review
- Survey was patterned after ISO-type management system evaluations
- The data presented reflects the participation of ten NASA Centers:

- ARC	- LaRC
- DFRC	- LeRC
- GSFC	- MSFC
- HQ	- KSC
- JSC	- SSC

## **Focus Areas**

- Policy
- Responsibility and Authority
- Goals and Objectives
- Resources
- Design, Test and Process Involvement
- Site Inspection and Exposure Evaluation Process
- Vulnerability Assessment
- Purchasing Products
- Contractor Services
- Communication
- Training
- Record keeping
- Corrective and Preventive Actions

## **Summary**

- The Center Self Assessment data will provide an essential baseline on the status of OHP management processes at NASA Centers
- That baseline will be presented to Enterprise Associate Administrators and DASHO on September 22, 1998 and used as a basis for discussion during FY 99 visits to NASA Centers
- The process surfaced several key management system elements warranting further support from the Lead Center
- Input and feedback from NASA Centers will be essential to defining and refining future self assessment efforts

## SESSION I

### Occupational Health Program Performance Measures (Metrics)

**Emmett B. Ferguson, Jr., MD, MPH**  
Manager, NASA Occupational Health Support Office  
The Bionetics Corporation, Kennedy Space Center

#### **Goal**

Identify a core set of program metrics which will serve as best indicators at the Agency level to show how well the OHP efforts are working across all NASA Centers. To qualify, a metric must be value added for the NASA Center, either for advocating locally or for tracking on-site performance.

#### **Introduction**

Occupational Health Services are periodically re-justified to senior management. This process can best be accomplished by taking objective measurements of the services provided. There are three general categories of metrics, which are familiar, and are used formally, or informally to describe and justify services. They are:

- Quality assurance metrics
- Productivity metrics
- Outcome metrics

Patient satisfaction surveys and retrospective medical record audits help to measure quality and are important when used to reassure users of a concern for maintaining quality of local service. Both these types of metrics are important and should be thoughtfully collected for internal and local use. However, they are of very limited use in comparing services with those of other NASA Centers or Agencies.

Counting the number of clinic visits and exams are measures of productivity and may be important when advocating for services locally. They may be presented as factors in justifying cost.

Outcome measures often require a more intensive effort to collect and are more difficult to quantify, but they may be the most useful for our program management needs. Our challenge is to find a few performance measures that can be collected without extreme hardship on the NASA Centers that are of significant use to demonstrate the value of providing Occupational Health Services and for comparing the effectiveness of those services with similar services in other Agencies.

## Quality Assurance Metrics

The following list of quality assurance metrics is presented for discussion. We are optimistic that some of them will be acceptable and useful.

### 1. Early Medical Intervention

Metrics for this service are based on the number of instances in which a NASA clinic diagnoses a potentially serious health condition. They also involve initiating the necessary treatment or referral to mitigate the risk and assure continued worker productivity.

- Measure frequency of diagnosis
- Measure severity (life threatening, lost time potential, quality of life, etc.)
- Measure case disposition/resolution

These metrics indicate the effectiveness of preventative efforts, the value of the service, or return on investment. They are potentially useful for preserving select services during budgetary downturns.

The following list are presented as measures of outcome and cost avoidance even though they may be more difficult to collect.

1. Blood pressure	New Diagnosis - Treated hypertension	_____
2. Blood sugar	New Diagnosis - Treated diabetes	_____
3. Blood lipids	New Diagnosis - Treated hyperlipidemia	_____
4. Electrocardiogram	New Diagnosis - Cardiac work-up	_____
5. Treadmill exam	New Diagnosis - Treated ischemic heart disease	_____
6. Pap test	New Diagnosis - Cervical or uterine cancer	_____
7. Hemocult exam	New Diagnosis - G I bleeding/polyp/cancer	_____
8. Procto sigmoidoscopy	New Diagnosis - G I bleeding/polyp/cancer	_____
9. Mammography	New Diagnosis - Breast cancer	_____
10. PSA	New Diagnosis - Prostate cancer	_____

Reporting the number and percentage of abnormal results from mammography, hemocult, sigmoidoscopy and PSA testing is recommended. While determination of the outcome often takes considerable effort, it is well worth that extra effort.

### 2. Health Related Incidents

The number of times in which a NASA employee is exposed or injured by an occupational health risk factor to the point of needing medical assistance, is documented.

- Measure severity (first aid, off-site treatment, lost time, permanent disability, etc.)
- Measure frequency of occurrence and plot over time

This metric determines the effectiveness of recognition, evaluation and control of occupational health risk factors and identifies areas needing improvement or additional emphasis.

### **3. Regulatory Experience**

Visits by personnel from the Occupational Safety and Health Administration (OSHA) and the Nuclear Regulatory Commission (NRC) to each NASA Center are measured annually.

- Measure the number of visits
- Measure the number of violations/citations or the absence of violations

This measurement indicates the readiness of NASA Safety and Health Programs to meet statutory requirements.

### **4. Workers' Compensation**

The number of cases and costs for incidents in which a NASA employee is injured, to the extent that they are compensated for medical costs or lost time due to the injury, are documented.

- Plot NASA and NASA Centers' Office of Workers' Compensation Program (OWCP) performance on historical basis
- Plot NASA OWCP performance against Federal Agency and aerospace industry
- Identify number of cases, number of long term cases, case severity (cost)

Improvements in safety performance and case management are indicated.

### **5. Lost Time and Recordable Injury Rates**

Use standard industry metrics as a gauge to determine how NASA performs compared to the Federal sector and private industry.

- Plot NASA LTI rate vs. NASA goal
- Plot NASA LTI rate over time (multi-year analysis/trends)
- Plot NASA LTI against aerospace sector, industry, and international agencies

### **6. Exposure Evaluation Process**

Determine the number of occupational health evaluations that are conducted, coupled with the success of those evaluations for use in controlling an occupational health hazard. *These metrics may be very difficult to obtain.*

- Measure the number of occupational health assessments (based on definition of assessments)
  - Possibly categorize regarding reactive vs. proactive nature of assessment
  - Possibly track only the number of events in which industrial hygienists participated, due to inadequate designs/procurement controls
  - Identify which of those assessments identified an uncontrolled situation requiring engineering or administrative controls or personnel protective equipment
- Identify the number of exposure evaluations that exceeded action level or PEL/TLV.

By using this metric, a NASA Center's efficiency rating in implementing appropriate controls is documented along with the effectiveness of line management's involvement in adopting controls prior to exposure.

### **7. Employee Assistance Program Visits**

## Productivity Metrics

### 1. Total number of clinic visits not including physical exams

- Health screening other than physical exams  
This category includes such services as: blood pressure checks, immunizations, pulmonary functions, prostate specific antigen (PSA) tests, mammography exams, stool exams for blood (hemocult), procto/sigmoidoscopic exams, and exercise EKG tests (treadmill exams). It also includes audiograms, blood sugar tests, blood lipid exams, and overseas travel clearance.
- Illness/injury care
  - Work related
  - Other

### 2. Exposures evaluated

- Respiratory (Acute/Chronic)
- Dermatological (Acute/Chronic)
- Ophthalmologic (Acute/Chronic)
- Other

### 3. Physical examinations (total, completed physicals only)

- Health Maintenance  
(These exams are not work required, such as FEHP, annual, periodic, routine, executive, part 1,2. etc.)
  - Civil Service
  - Other
- Work related (count only completed physicals)  
(These physicals are conducted for employment and include: pre-placement, baseline, preassignment, Fitness for Duty, Return to Work, termination, certification/licensing, and Surveillance, or for specific job assignments.)
  - Civil Service
  - Other

### 4. Employee Assistance Program visits (Total)

- Civil Service
  - Total visits
  - New client visits
- Other
  - Total visits
  - New client visits

## Outcome Metrics

### 1. Satisfaction with service and care surveys (Total)

- Access to Physician (appointment availability)
- In-clinic waiting time

### 2. Retrospective Chart Audit

## SESSION I

### Essential Components of the Occupational Medicine Program

**Emmett B. Ferguson, Jr., MD, MPH**

Manager, NASA Occupational Health Program Support Office  
The Bionetics Corporation, Kennedy Space Center

#### **Introduction**

The information assembled and presented here is a refined addition of the information presented and discussed at the video conference with NASA Center Medical Director's and Contracting Officer's Technical Representatives about two months ago. The comments provided at that time on the essential components have been incorporated into this presentation. The intent is to again review the essential components before a final draft is circulated to the NASA Centers and presented to the Executive Council. The importance of this document is that it may become the minimum requirement of all occupational medicine services within the Agency and a measurement against which programs will be evaluated. It may also become the benchmark for procurement of occupational medicine services in the Agency. The other potential benefit is that such a document can provide for standardization of services and perhaps prevent reduction in workforce beyond that necessary to provide these essential elements.

#### **Essential Components**

The essential components proposed for discussion are: 1) physician availability, 2) clinical care services, 3) physical examination services, 4) emergency medical services, 5) traveler health services, 6) regulatory compliance, 7) investigation of health and environmental risks, 8) employee assistance services, 9) health education and wellness services, and 10) quality assurance.

##### **1. Physician Availability**

A physician trained in a preventative medicine specialty and experienced in occupational medicine is responsible for all aspects of the occupational health service and is available during clinic hours.

##### **2. Clinical Care Services**

Treatment services are conveniently available for work-related illnesses and injuries to the civil service workforce including case management and Office of Workers' Compensation Program (OWCP) reporting. Investigation of even the most minor work related illness or injury is a key part of preventing future health problems in the workplace. (**Note:** This statement indicates that it is essential for these services be provided to the civil service workforce and removes mention of clinic services to other categories of NASA Center personnel.)

### **3. Physical Examination Services**

The following five categories of Physical Examinations are provided: Pre-placement Physical Exams, Surveillance Physical Exams, Job Certification Exams, Health Maintenance Physical Exams and Special Purpose Exams. (Any reference to fitness for duty has been removed. This category of exam will be addressed under Special Purpose Exams.)

### **4. Emergency Medical Services**

Prompt emergency medical services (EMS) for NASA Center personnel are necessary. The ambulance equipment and crew must meet the requirements of the State for advanced life support designation. This usually means that at least two crew members must be on the ambulance and one must be a paramedic. EMS response time to any on-NASA Center location varies with resources available in the community, but must be acceptable to the NASA Center management. If the occupational medicine service is not directly responsible for EMS, then a mechanism is in place for the medical director to perform a quality assurance review of reports from EMS responses to the work site. (As a result of the discussion, the eight-minute response time was modified.)

### **5. Traveler Health Services**

Many NASA and contractor employees travel frequently on work related assignment. Safeguarding the health of these travelers is a major occupational medicine concern. The emphasis on travel medicine and traveler health services may differ with the circumstances of the travel assignments. Those NASA Centers having many travelers to developing countries must provide comprehensive services. Sources of reliable information include the Center's for Disease Control and Prevention, International SOS Services, and the recently publicized ProMED Mail. The Internet address is given in the slide.

### **6. Regulatory Compliance**

Compliance with Federal and State health and environmental regulations is mandatory. The statutory nature and very high potential fines for non-compliance make compliance a high priority. The goal is to provide well-planned proactive programs to anticipate and avoid any non-compliance issues. Effective programs require close coordination and sharing of resources and information between the health, environmental and safety disciplines. Every program has an established review procedure to assure compliance with all applicable regulatory requirements.

### **7. Investigation of Health and Environmental Risks**

Effective prevention of workplace illness and injuries begins with reporting and investigating all mishaps. If one assumes that all accidents are preventable then minor incidents, even of less than OSHA reportable severity, must be identified and investigated. The program is a cooperative effort by many offices and organizations. Accurate data on workplace injury/illness severity and loss time occurrences are necessary to evaluate the success of the program.

## **8. Employee Assistance Services**

The Employee Assistance Program (EAP) is more than a counseling service for substance abusers. To be maximally effective, the counselors provide recurring training to managers and supervisors about the scope and appropriate use of the program and early recognition of mental health problems in themselves and co-workers. Confidentiality and integrity of the program must be assured, or those who most need the service will not use it. Providing this protection is management's responsibility. No diagnostic or treatment details are available to the employer. The role of the EAP most clearly relates to rehabilitation, not punishment.

## **9. Health Education and Wellness Services**

There is increasing evidence that health education and wellness services can be cost effective. In order to reduce work absences and employee health care costs the program must offer baseline Health Risk Appraisals (HRA's) to identify people at increased risk of cardiovascular, neurovascular, and/or behavioral events. Aggressive risk-focused educational programs reduce risk factors of those individuals identified by the HRA to be at increased risk of heart attack, stroke or other serious event. Documentation of the effectiveness of the efforts to reduce risk must be provided through follow-up testing.

## **10. Quality Assurance**

Techniques to measure quality and assure continuous improvement in every component of the occupational medicine services are available. These measurements are effective in implementing improved operations and are useful to managers of the NASA Center program as well as the Agency occupational health office.

Upon review and discussion of these essential components and distribution of the reference document, it is requested that attendees at the meeting respond to the Agency Occupational Health Program Office at Kennedy Space Center with comments and recommendations.

## SESSION I

### **Physical Examination Nomenclature and Standardization**

**Emmett B. Ferguson, Jr, MD, MPH**

Manager, NASA Occupational Health Program Support Office  
Kennedy Space Center

The purpose of this presentation is to introduce a draft document for your consideration and review. The NASA Occupational Health Program proposes usage of the following categories and definitions of physical examinations.

#### **Pre-Placement**

Pre-Placement physical examinations are conducted before assignment to the job in order to determine if an employee can safely and adequately perform the essential functions of the job. The essential functions for the job are identified by management and communicated to the examiner.

#### **Surveillance**

Surveillance physical examinations are only a small part of a comprehensive surveillance program but are the most useful method to detect unsuspected exposures or early health risks. The extent of worker and workplace surveillance varies with environmental and physical risks to the worker. Descriptions of hands-on, laboratory and special procedure exams required for each category of surveillance physical examinations are available in writing. If the exams are not performed on-site, the Occupational Health Program Medical Director must review the results before clearance is issued to work on a Center in a hazardous environment.

#### **Job Certification**

Job certification examinations may be required by Federal or State statutes or by the employer or employing agency. Examples of certification exams are those required by the Department of Transportation and Federal Aviation Administration. The Agency or organizations establishing the requirement specify the medical, laboratory and special procedure standards for these examinations. If the examinations are not performed on-site, the Occupational Health Program Medical Director must review the results before certifications are issued for performing the job.

#### **Health Maintenance**

Health maintenance physical examinations are usually voluntary and offered at an age-related frequency. They are most effective in maintaining a healthy work force if incorporated into a comprehensive wellness program. The information gathered at the time of the examination might be used to assess health risks and to provide the basis for a focused, risk reduction program for the individual.

## **Special Purpose**

Special purpose examinations include other exams that may be unique to the Center or organization and may not be recurring. Examples of special purpose exams are fitness for duty, retirement, disability, prime crew contact, etc. A physical examination matrix is being distributed to each person in this session. There are seventy-one types of physical examinations that are covered by this matrix. Please review the matrix to determine if there are any examinations currently being performed at your Center that should be added to this list. Once the list is returned with comments, a document will be developed to address in narrative the elements of each type of physical examination. This document is intended to become a standardized directive for all physical examinations conducted within the NASA Occupational Health Program. Your participation and input are important to assure that the special operations or concerns of each Center are considered and included while requirements for the program are being developed.

# NASA Physical Examination Matrix

	See Text	Frequency	Audiogram	BI Chemistry Profile	Complete Blood Count	CXR, PA	CXR, PA Baseline	Differential, manual	ECG	GXT	Hemocult (offer)	History (work & medical)	HT, WT, Vital Signs	Immunizations	PFT	Tb skin test	UA (dipstick + micro)	UA (dipstick)	Abdomen	Back, joints, extremities	Complete Physical	Heart, Peripheral vessels	HEENT	Lungs	Lymph nodes	Neck	Nervous System	Rectal, Prostate	Skin, nails, hair	Color perception	Depth perception	Peripheral Vision	Tonometry	Visual Acuity	Written Opinion			
			<b>I Replacement Exams</b> PP = Placement R = Required D = Examiner Discretion O = Offered AD = Age Determined K = KSC Requirement Q = Variable or Exposure Determined W = When Requested																																			
1	Civil Service Pre-Placement Exam	PP	R	R	R	R	R	R	R	R	O	R	R	R	R		R	R																				
2	Pre-Employment Screening	PP	R	R	R	R	R	R	R			R	R	R	R																							
			<b>II Surveillance Exams</b>																																			
1	Arsenic	PP/Q																																				
2	Asbestos	PP/12																																				
3	Benzene	PP/12																																				
4	Beryllium	PP/24																																				
5	Cadmium	PP/Q																																				
6	Chemical Lab Worker	PP/12																																				
7	Chromium	PP/12																																				
8	Ethylene Oxide	PP/12																																				
9	Formaldehyde	PP/12																																				
10	Hazardous Materials	PP/12																																				
11	Hazardous Waste Workers	PP/12																																				
12	Hearing Conservation	PP/12																																				
13	Insect & Pest Control (Pesticides/Herbicides)	PP/12																																				
14	Lead	PP/Q																																				
15	Mercury	PP/12																																				
16	Methylene Chloride	PP/12																																				
17	MDI/TDI	PP/12																																				
18	MOC/MDA	PP/12																																				
19	MPDA	PP/12																																				
20	Nickel	PP/12																																				
21	PCB's	PP/12																																				
22	Silica Dusts, etc.	PP/12																																				
23	Spray Painting	PP/12																																				
24	Thermal Oblative/DMES	PP/12																																				
25	Trichlorethylene	PP/12																																				
26	Tungsten Carbide	PP/12																																				
27	Water & Sewage	PP/12																																				



## SESSION II

### Employee Assistance Program Issues

**Alan G. Gettleman, MBA**

Kennedy Space Center

**William McGuire, MA, CEAP**

EG&G, Florida, Inc., Kennedy Space Center

Employee Assistance Program (EAP) officers, as well as personnel in other disciplines from eight NASA Centers, attended this breakout session. Ms. Brenda Blair, MA, CEAP, a guest speaker at the conference, also attended as a consultant.

Representatives from the NASA Centers introduced themselves and spoke briefly about their programs. In a discussion related to the conference theme on benchmarking, quality control issues within the EAP community and adequate documentation of cases were addressed. Disposition and provision for quality assurance checks for EAP providers in single person offices were also discussed. Ms. Blair presented methods for consulting with other NASA personnel in single person EAP offices as a quality control measure.

EAP intervention in critical incidents was discussed. The question of whether EAP assistance is an asset or a potential liability in those situations was addressed. Suggestions were made of topics for future EAP video-conference topics. A program on EAP ethics was planned for a September video teleconference.

Each person was asked to provide intake forms they use to Mr. Gettleman or Ms. Blair. Ms. Blair said she would review the forms to ensure that adequate notification is provided to the client for confidentiality. She would also review them to ensure they have adequate limits of confidentiality—a topic for future video conferencing.

Mr. Gettleman described the NASA initiative to reduce stresses in the workplace, and the activities of an ad-hoc EAP group that will make recommendations to NASA senior management. Alternative training methods were discussed for reaching target audiences such as employees at risk, supervisors, and others.

Pfc. David A. Pendleton, Victim Assistance Coordinator, U.S. Capitol Police, U.S. House of Representatives made a special presentation. Pfc. Pendleton was on duty during the tragic shooting of two Federal guards at the U.S. Capitol. He related the events immediately after the incident. He described the nature and structure of the EAP's and the separate nature of the House and Senate programs. This episode was a particularly difficult situation as large numbers of tourists were involved.

William S. Barry, MD, the new Manager of the NASA Occupational Health Program Office was introduced to those attending the breakout session.

## SESSION III

### Benchmarking for Excellence and the Nursing Process

**Claire Sleboda, RN, BSN, COHN-S**

Chief Nurse, Health Unit  
Dryden Flight Research Center

#### Introduction

Nursing is a service profession. The services provided are essential to life and welfare. Therefore, setting the benchmark for high quality care is fundamental.

Exploring the definition of a benchmark value will help to determine a best practice approach. A benchmark is the descriptive statement of a desired level of performance against which quality can be judged. It must be sufficiently well understood by managers and personnel in order that it may serve as a standard against which to measure value.

#### Purpose

Benchmarks:

- Improve quality of nursing care
- Decrease nursing practice irregularities
- Decrease cost by eliminating nonessential activities
- Provide a target or a gauge against which to measure performance

The benchmark set is that level of care agreed upon by the medical staff as necessary to achieve desirable care and treatment for a specific group of individuals. Consequently, benchmarks for a group of pilots may be different than that for a group of aircraft mechanics. Once the benchmarks are agreed upon; each health unit can use them to monitor their performance and note their progress over time.

Before a benchmark can be determined however, information must be gathered and data analyzed. With this in mind, the nurses met to determine which elements work and which do not. Where are we now and where do we want to go? Listed below are a few of the objectives that were defined during the round table discussion.

#### Objectives

Identify at least three work practice differences among the NASA Health Units

1. Dryden nurses are the only medical staff designated as the first responders in an emergency.
2. Dryden and Johnson nurses are required to respond to the Day Care Center in an emergency.
3. Goddard does not allow contractors to use the gym.
4. Not all health units have standing orders.
5. Medical records arrangement and the variety of forms used.
6. Pharmacy laws and on-site dispensing of medications vary widely.

Identify at least three work practice similarities among the NASA Health Units

1. Physicals are offered under the following guidelines:
  - Under 45 every 3 years
  - Over 45 every other year
  - Short/abbreviated annually
2. Blood work drawn on site and sent to local laboratories.
3. Clearance for gym use
4. Allergy injections offered to civil service personnel who have seen their PMD and provide their own serum

Identify at least three methods of monitoring Medical Surveillance Programs

1. Walk through/physical inspection
2. Computer software Program (OHM, HIMS, MOM)
3. Rely on information from Safety/ Industrial Hygienist

List at least three occupational exposures that require medical monitoring

1. Noise
2. Lead
3. Asbestos
4. Confined Space

Describe at least three methods of Reporting Occupational Injuries

1. OSHA 200 Log
2. Incident/Injury forms
3. NASA Mishap form 1627

Our goal at this point is to disseminate the information obtained and meet again, possibly via teleconference, to break down the data and begin to set our nursing benchmarks. When a benchmark is used as a target, it becomes a planning tool. When used as a criterion against which to evaluate performance, the benchmark becomes a control device. This capability strongly resembles the nursing processes – gathering data, planning, implementing and evaluation, processes every registered nurse is very familiar with. At this stage, we are just completing the gathering of data and intend to move onto the planning stage. However, even after a benchmark is set and evaluated, it functions only as a guide, a temporary working model because through use, changes and improvements will occur. Thus the process continues, each revision reflecting a higher level of care.

*A special thank you to Beverly Damewood, RN for her assistance throughout this undertaking.*

## SESSION IV

### **NASA Occupational Health Procedures and Guidelines on Health Services for International Travel or Assignment**

**Emmett B. Ferguson, Jr., MD, MPH**

Manager, Occupational Health Program Support Office  
The Bionetics Corporation, Kennedy Space Center

This draft document is presented for discussion to obtain feedback in a timely fashion. It is intended that the comments made at this meeting today will be incorporated in the draft document. The document will be put into the NASA online directives system for coordination.

### **DRAFT**

### **NASA Occupational Health Procedures and Guidelines on Health Services for International Travel or Assignment August 27, 1998**

#### **1. Purpose**

This NASA Occupational Health Procedures and Guidelines prescribes the responsibilities and procedures for safeguarding the health of NASA employees on international travel or assignment. The goal of the traveler health services is to prevent travel-related illness or mishap and promote effective management of health issues while on foreign travel. This document establishes the minimum traveler health program content. It is recognized that NASA Centers may have additional needs based on the specific number, composition, mission and destination of the traveling employees. This document should not limit NASA Centers from providing additional services in order to meet their unique requirements.

#### **2. Applicability**

This NASA Occupational Health Procedures and Guidelines applies to NASA Headquarters and NASA Centers.

#### **3. Authority**

- a. FPM Chapter 339, Subchapter S1-2C, dated August 25, 1975.
- b. Federal Employees' Compensation Act, as amended (5<sup>th</sup> U. S. Code 8101, 1994).

#### **4. Responsibilities**

##### NASA Occupational Health Program Office

The NASA Occupational Health Program (OHP) Office, Kennedy Space Center, Mail code JJ-H, FL 32899 is responsible for providing current procedures and guidelines to NASA Headquarters and NASA Centers for safeguarding the health of NASA international travelers. Questions regarding this document should be addressed to the NASA OHP Office.

##### Headquarters and NASA Centers

NASA Headquarters and NASA Centers are responsible for safeguarding the health of their employees during international travel and assignment. This responsibility includes monitoring of sanitation and environmental conditions if necessary for the health and safety of the workforce during foreign assignment.

#### **5. Traveler Health Services**

Every NASA Center, through their Occupational Health Services, shall offer traveler health services for NASA personnel. NASA contractors performing official international travel or assignment may also be afforded those services where local NASA Center policy and resources allow it. NASA Centers with many travelers to Russia, the transatlantic abort landing (TAL) sites and developing countries should provide comprehensive services including:

1. General pre-travel briefing and information
2. General health risk assessment
3. Immunizations
4. Traveler's diarrhea information and advice
5. Malaria risk assessment and advice if appropriate
6. Air travel and health information (including "jet lag" advice)
7. Destination safety information
8. Travel kits in accordance with NASA Center policy (see section 6)
9. Post travel follow-up scheduling and advice
10. Sources of information to include:
  - U.S. Embassy or Consulate location and phone numbers
  - Hospital/clinic locations and phone numbers
  - How to access emergency assistance
  - Insurance advice
  - International SOS Assistance cards and information
11. Pre-travel evaluation of any environmental health issues/concerns, identification of personal protective equipment, training needs, etc.
12. Monitoring of sanitation and environmental conditions as indicated at traveler destinations

Those NASA Centers with travelers predominantly to western and developed nations are encouraged to tailor the services to the needs of their workforce. NASA Centers shall assure that the traveler has current medical certifications for any work to be done while on foreign assignment and has no health condition which would put the employee in jeopardy during travel. Travel clearances may be obtained from the employee's personal physician unless a specific medical surveillance or job certification is needed. Specific NASA job certification exams must be performed or reviewed by the NASA Center Occupational Health Services. Each NASA Center may publish more specific travel standards or requirements if indicated for special purpose or special destination assignment.

## **6. Immunization and International Certificates**

Yellow fever is the only vaccination **required** by International Health Regulations. Health authorities in some countries, particularly in Africa and Asia, may require an International Certificate of Vaccination against yellow fever as a condition of entry. Yellow fever certificates of vaccination are valid for 10 years beginning 10 days after primary vaccination or on the date of revaccination if within 10 years of the first injection. The certificates are official statements that proper procedures have been followed to immunize the traveler against yellow fever.

The Public Health Service, Centers for Disease Control and Prevention (CDC), has authorized NASA to validate International Certificates of Vaccination against yellow fever and cholera when such vaccinations are performed at NASA installations, with authorized NASA validation stamps. Because of its thermolability, it may not be feasible at some NASA Occupational Health Units to maintain a stock of yellow fever vaccine. Other local arrangements may be made for yellow fever immunization.

Medical Directors of NASA Installations, or those personnel under their supervision and so authorized, will affix the NASA approved validation stamp and sign the International Certificates of Vaccination (PHS-731). Each stamp bears the number unique to the using installation. Duplicate stamps will not be issued and will not be made or otherwise obtained. Stamps will be safeguarded when not in use. Loss or theft of a stamp will be reported immediately to the Office of the Manager, NASA Occupational Health Program, Kennedy Space Center, Florida.

A number of immunizations may be **recommended**, depending upon the traveler's itinerary and destination. Immunizations required or recommended in accordance with current CDC publications may be given to NASA employees, to employees of other government agencies, and to contractors and grantees assigned to the installation for regular work purposes. These services may also be obtained from community health clinics. Current immunization recommendations and information can be obtained by contacting the CDC. The 24-hour telephone number is (404) 332-4559.

## **7. Travel Medical Kits**

Travel medical kits are authorized for local assembly and issuance to NASA and NASA contractor employees traveling on official NASA business. Travelers may be required to return medical kits to clinic staff at the discretion of each Installation. Instructions for the use of the contents will be developed by each NASA Installation and included with the kit. Installation Medical Directors may customize the contents of the kit and instructions as appropriate for the individual traveler and overseas destinations.

The following is a recommended minimum list of “over-the-counter” medical items for the kit: oral preparations to include minor pain control, motion sickness preventive, decongestant, diarrhea preventive, antacid, antihistamine, cough suppressants, topical preparations to include steroid cream, antibiotic ointment, and antiseptic preparations.

## **8. Medical Services For Personnel Assigned to an Overseas Duty Station**

NASA has contracted with International SOS Assistance, Inc. to provide for medical assistance for NASA and NASA contractor employees while traveling globally on NASA related business. Medical assistance includes pre-trip medical referral information, 24-hour worldwide medical assistance, emergency medications, hospital deposit guarantee, medical monitoring, dispatch of a doctor, emergency evacuation, medical supervised repatriation and repatriation of mortal remains. Personal assistance provided by International SOS Assistance, Inc. includes embassy and consular information, lost document assistance, emergency message transmission, emergency personal cash, legal access, translation and interpreters. SOS® Access® Cards are available at the NASA Headquarters and NASA Center Occupational Health Units during business hours. For specific pre-trip information or for a complete description of the services provided by International SOS Assistance, Inc. call 1-800-523-6586 or visit their Web site at <http://www.intsos.com>.

While assigned to some overseas duty stations, NASA employees may be able to obtain medical services from United States State Department Health Units (provided that the State Department has issued prior medical clearance). Availability, extent and authority for such services should be confirmed before travel by contacting the NASA Center Travel Office. The State Department “International Cooperative Administrative Support Service” (ICASS) program is primarily to provide available health services to Federal Government employees who are to be assigned to a site for more than two months. Medical clearance to assure that the traveler is at low risk for foreign incapacitation is required by the State Department. NASA contractor employees are not eligible for this service.

## **9. Personal Medical Insurance Coverage**

The NASA contract with International SOS Assistance, Inc. (see paragraph 8) provides for 24-hour worldwide assistance. The costs of medical care, including emergency medical evacuation, are not covered by this contract. While NASA travelers are usually covered by the State Department on a NASA reimbursable basis, travelers should confirm with their employer and personal health insurance carrier how medical costs for both work related and personal illness or injury will be paid. Personal medical and hospitalization insurance is advisable to provide adequate medical coverage both overseas and during travel back to the United States; to obtain outpatient care where State Department medical services are not available; and to maintain, if desired, the required five years of insurance coverage prior to retirement. The Office of Personnel Management (OPM) advises that the current government-wide service benefit plan, administered by Blue Cross Blue Shield, and the employee organization plans will reimburse members for covered medical expenses incurred worldwide. Reimbursement may be at a preset rate and not for the full amount of charges. The pre-paid Comprehensive Medical Plans/Health Maintenance Organizations, commonly referred to as the CMP/HMOs, which are open only to employees residing in the geographic area served by the plan, do not cover overseas medical expenses.

## **10. Handling of Occupational Injuries and Illnesses**

NASA employees who suffer a traumatic injury or occupational disease while performing their official duties may be eligible for compensation benefits under the Federal Employees' Compensation Act (FECA).

Individuals should obtain necessary medical treatment as outlined in paragraph 8. In addition, they should contact the Compensation Claims Officer at their parent NASA installation to receive necessary instructions, to obtain forms to report the injury or work related illness and to claim compensation benefits. See NPD 1840.1 "NASA Workers' Compensation Program" for details.

NASA contractor employees should contact their company benefits offices before travel to determine availability of personal and work-related injury-illness insurance coverage during the foreign travel and assignment. Many third party benefits programs do not provide coverage during foreign travel. It may be necessary to arrange for additional insurance or confirm that the employer will take care of any personal or work-related medical costs. The rules regarding Workers' Compensation benefits vary from state to state. It is the individual traveler's responsibility to be certain that comprehensive information is obtained before travel.

### **11. Medical Services For Employees on Temporary Duty (TDY) Overseas**

NASA employees on TDY may be covered by the State Department ICASS Program discussed in paragraph 7. Approval must be obtained prior to travel by contacting the NASA Center Travel Office to determine eligibility. If services are not available, the employee will obtain and pay for the necessary outpatient treatment required and may be eligible to be reimbursed through their own personal health insurance coverage. Temporary overseas travel orders should not be issued to employees with medical problems until clearance/approval has been received from the facility Occupational Health Unit. Questions should be addressed to the NASA Occupational Health Program office and/or Installation Occupational Health Services. Every NASA installation should offer traveler health services as an integral part of the provided Occupational Health services.

### **12. Centers For Disease Control and Prevention Information Publications**

Each NASA Installation Occupational Health Service Medical Director will have available current issues of the following CDC publications:

- a. Health Information for International Travel (current year)
- b. Morbidity and Mortality Weekly Report
- c. Weekly Summary of Countries with Areas Infected with Quarantinable Diseases
- d. Advisory Memoranda
- e. Biweekly Summary of Health Information for International Travel (Blue-Sheet)

These publications are available from the Department of Health and Human Resources, Center for Disease Control, Division of Quarantine (E-03), Attn.: Travelers' Health Activity, Atlanta, GA 30333. They may be obtained without charge by requesting to be placed on the appropriate distribution lists.

The CDC also has a 24-hour telephone hotline for dispensing health information related to international travel. The telephone number is (Commercial) 404-332-4559.

### **13. Notification of Medical Incident**

Each NASA Center is requested to contact the NASA Occupational Health Program Office, Mail Code JJ-H, Kennedy Space Center, FL 32988, in the event that a traveler from their NASA Center is involved in a medical incident or evacuation, when such information may be prudent to protect other NASA travelers.

#### **Comments:**

All sections of the draft document were coordinated and approved without significant comment except for Section 3, Authority. It was pointed out, that FPM Chapter 339, Subchapter S1-2C, dated August 25, 1975 is no longer current. This document was not replaced. Hence, the authority section will contain only Item B which will be made Item A: Federal Employees' Compensation Act as amended, 5<sup>th</sup> U.S. Code 8101, 1994.

## SESSION IV

### RehabWorks at the Kennedy Space Center

**Mary K. Kirkland, ATC/L, CSCS**  
The Bionetics Corporation, Kennedy Space Center

#### **What is a Certified Athletic Trainer?**

The Certified and Licensed Athletic Trainer (ATC/L) is an allied health professional who specializes in treating musculoskeletal and athletic injuries. Trainers have national certification by the National Athletic Trainers Association Board of Certification. In 1990, the American Medical Association recognized athletic training as an allied health profession. Florida granted licenses to trainers in 1996. Members of this profession work in professional, collegiate, and high school settings and sports medicine clinics. Trainers in a corporate/industrial setting such as KSC RehabWorks, provide services for injury prevention, rehabilitation and reconditioning for “industrial athletes.”

#### **The “Industrial Athlete”**

Like counterparts on the playing field, employees sustain acute injuries such as sprains, strains, and contusions. Chronic injuries include lateral epicondylitis and rotator cuff impingement. The differences between the two types is apparent by the number and type of cumulative trauma injuries in the corporate/industrial arena, i.e., low back pain, carpal tunnel syndrome and postural imbalances. Although the mechanism or etiology is different for each type, the treatment is similar to what you would find in the collegiate athletic training room. After initial evaluation, the industrial athlete is rehabilitated and reconditioned for a safe and rapid return to work using current therapeutic modalities.

#### **Why on-site athletic training?**

In an effort to reduce workers' compensation costs, group medical costs and recovery time/light duty days, the corporate/industrial ATC/L is available to provide prompt treatment for injuries. First-hand knowledge of the work environment is valuable in developing the employee's rehabilitation protocol. The employee's normal work routine is maintained during the rehabilitation process and open lines of communication between all the parties involved leads to better case management. In addition to the convenience of on-site therapy, which diminishes travel time to and from an outside therapy clinic, the unique combination of injury prevention, rehabilitation, education, and fitness/wellness reduces workers' compensation costs while promoting a healthier workforce.

## **RehabWorks at KSC**

Developed in 1997, the current 400 square foot facility is located in the O&C building of the KSC Industrial Area. This free service is available to all NASA civil service and contractor personnel. The hours of operation are Monday - Friday 0830 - 1700 hours. The staff is comprised of the Supervisor - Mary K. Kirkland, ATC/L, CSCS, Assistant Athletic Trainer - Erik T. Nason, MS, ATC/L, EMT and Supervising Physician - Arthur Arnold, MD - Manager of Medical Operations. The Occupational Health Facility and outside physicians refer patients into RehabWorks. We also accept self-referrals and transfers from outside physical therapy.

### **“Early Rx into RehabWorks leads to rapid recovery and return to work”**

This quote heads our referral sheet. Like collegiate athletic training, the earlier the treatment, the more rapidly the employee can return to work. Rehabilitation appointments are scheduled directly with the employee. If the injury is work-related, therapy can be conducted during work hours, with approval of the employee’s supervisor. Non-work related and sports injuries are treated during off-duty hours or when convenient during working hours.

After the initial evaluation, the typical rehabilitation progression is as follows:

1. Modalities (ice, heat, electrical stimulation, ultrasound, passive range of motion) are utilized to reduce pain and inflammation.
2. Therapeutic exercise is initiated to regain muscular strength and endurance. At this stage, home exercise programs play a large role in the employee’s recovery process.
3. Utilizing the S.A.I.D. principle (specific adaptation to imposed demands), work reconditioning exercises are begun to prepare the employee for full return to work status. To limit time away from work, the RehabWorks staff works with a case manager and supervisor to ensure that the patient’s job tasks, while on light duty, serve to keep the patient active without exacerbating the symptoms. Additionally, Industrial Hygienists are contacted to assess the workstation/work area. Their recommendations are incorporated into the recovery process.
4. Patient education is vital in increasing the employee’s awareness of 1) how the injury occurred, 2) how to care for it while at home and 3) how to avoid re-injury. We find that there is a carryover effect in that the employee readily passes along any information to others in the work group.
5. During therapy and continuing after discharge, the patient utilizes the KSC Fitness Centers or local wellness facilities to maintain the level of conditioning gained during therapy. Happily, we find that many of our patients become active members of the KSC Fitness Centers, leading to an increased awareness of health and wellness in the work place.
6. Last, but certainly not least, constant communication occurs between the referring physician, Occupational Health Facility nurses, workers’ compensation representatives, if applicable, the previous physical trainer PT or ATC/L, the employee’s supervisor, and most importantly the patient!!!

## The future of on-site athletic training at KSC

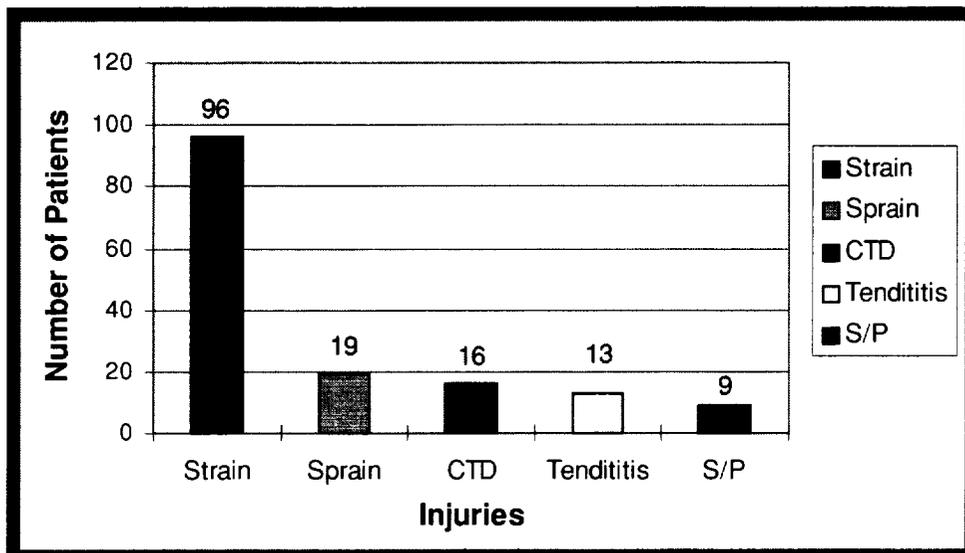
It is our hope that the RehabWorks facility will expand in square footage and staffing to accommodate increased patient referrals; that satellite facilities be developed in both the LC-39 and CCAS areas; and that the use of certified/licensed athletic trainers be implemented at all NASA facilities.

## Statistics/Cost Savings

These figures cover the time period from July 31, 1997 through June 30, 1998.

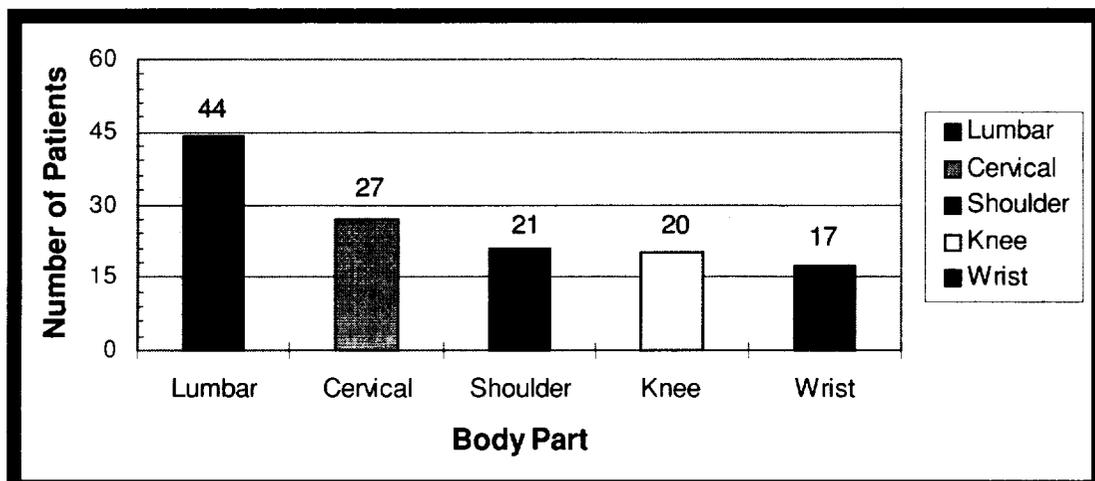
### Most Common Types of Injury

(Twenty types of injury were seen)



### Most Commonly Injured Body Parts

(Nineteen different injured body parts were treated)



## Results

<b><i>The average number of days between date of injury and 1st doctor's visit</i></b>	<b>24.21</b>
<b><i>The average number of days between 1st doctor's visit and 1st RehabWorks appointment</i></b>	<b>4.66</b>
<b><i>The average number of visits in RehabWorks</i></b>	<b>4.54</b>
<b><i>The average number of days enrolled in RehabWorks</i></b>	<b>16.45</b>

## Cost Savings

Month	Number of Patients	Number of Visits	PT Cost Savings	Estimated Indirect Savings	Estimated Costs	Net Total Savings	Total NET Return Cost Savings
July	25	79	\$ 6,435.00	\$ 3,950.00	\$ 1,021.00	\$ 9,364.00	\$1.00 : \$10.17
August	15	39	\$ 3,150.00	\$ 1,950.00	\$ 504.00	\$ 4,596.00	\$1.00 : \$10.12
September	22	73	\$ 6,215.00	\$ 3,650.00	\$ 943.00	\$ 8,922.00	\$1.00 : \$10.46
October	17	31	\$ 2,535.00	\$ 1,550.00	\$ 401.00	\$ 3,684.00	\$1.00 : \$10.20
November	12	40	\$ 2,980.00	\$ 2,000.00	\$ 517.00	\$ 4,463.00	\$1.00 : \$9.63
December	13	29	\$ 2,565.00	\$ 1,450.00	\$ 375.00	\$ 3,640.00	\$1.00 : \$10.30
January	25	61	\$ 4,100.00	\$ 3,050.00	\$ 1,754.00	\$ 5,396.00	\$1.00 : \$4.07
February	29	113	\$ 9,010.00	\$ 5,650.00	\$ 3,154.00	\$ 11,506.00	\$1.00 : \$4.65
March	33	152	\$ 11,980.00	\$ 7,600.00	\$ 4,204.00	\$ 15,376.00	\$1.00 : \$4.65
April	32	128	\$ 11,325.00	\$ 6,400.00	\$ 3,558.00	\$ 14,167.00	\$1.00 : \$4.98
May	46	135	\$ 10,415.00	\$ 6,750.00	\$ 3,747.00	\$ 13,418.00	\$1.00 : \$4.58
June	38	122	\$ 12,010.00	\$ 6,100.00	\$ 3,396.00	\$ 14,714.00	\$1.00 : \$5.33
<b>TOTAL</b>	<b>307</b>	<b>1002</b>	<b>\$ 82,720.00</b>	<b>\$ 50,100.00</b>	<b>\$ 23,574.00</b>	<b>\$ 109,246.00</b>	
<b>AVERAGE</b>	<b>26</b>	<b>84</b>	<b>\$ 6,893.00</b>	<b>\$ 4,175.00</b>	<b>\$ 1,965.00</b>	<b>\$ 9,104.00</b>	<b>\$1.00 : \$7.43</b>

## SESSION IV

### Health Risk Appraisal and Health Education Programs

**Emmett B. Ferguson, Jr., MD, MPH**

Manager, NASA Occupational Health Program Support Office  
The Bionetics Corporation, Kennedy Space Center

#### **Introduction**

An integral part of all NASA Center Occupational Health Programs should be an effective Health Education Program (HEP). An effective HEP should focus resources on preventing premature or disabling health problems in those employees at greatest risk of developing preventable health problems. Resources can be used most effectively and efficiently if they can be identified and offered intervention as early as possible. The Health Risk Appraisal (HRA) is a standardized instrument used to stratify risks for cardiovascular, cerebrovascular and behavior-related illness in a population. The HRA should be acceptable to the subject and the user. It should be simple, easy to complete and inexpensive.

#### **Evaluation of HRA Use at NASA Centers**

A general evaluation of HRA's in use at the NASA centers was completed in May 1998. Many centers do not use an HRA, and hence, do not have an optimal HEP. Both the NASA Occupational Health Program Office and the NASA Occupational Health Program Support Office at KSC have received several briefings about proposed HRA related wellness programs.

The results of the survey are shown as follows:

- ARC: No forms are in use.
- DRFC: A generic American Heart Association Cardiac Risk Assessment form called "RISKO" is used. This form is a four-page handout that provides risk modification advice based on responses to questions of Sex (M/F), Systolic Blood Pressure, Total Cholesterol, Smoking Status, Height and Weight
- GFSC: No forms are in use in the Clinic. We were told that some forms are used in the Fitness Center and that the Cooper Center HRA Form is recommended. No examples were received.
- HQ: The Carter Center form is used. This is a four-page form that has 43 questions.
- JPL: No forms are in use.

- JSC: No standard form is in use. We were told that JSC had reviewed both the Wellsource and Johnson & Johnson forms and favored Wellsource because it would be better suited for the astronauts and families. JSC sent copies of an annual toxic substance screening form and a Respiratory Protection Program 11-page form from the Federal Registry that they administer to appropriate employees through the Clinic.
- KSC: The Base Operations Contractor (BOC) uses the Johnson and Johnson Live-for-Life forms for their employees. A modified USAF HRA is used for the annual February Cardiovascular (center-wide) Risk Screening.
- LaRC: The Healthier People form, a modification of the original Carter Center HRA, is used at the Clinic. The LaRC Fitness Center also uses a similar HRA form.
- LeRC: No form is in use at the Clinic. The Wellsource HRA is used at the Fitness Center.
- MAF: No form is in use.
- MFSC: The clinic uses the Carter Center form occasionally. The Fitness Center also uses the Healthier People HRA.
- SSC: No form is in use. There is a form that is sometimes used during Hypertension Awareness Month.
- WFF: No formal HRA is used, but laboratory forms that give a Coronary Heart Disease risk based on the Total Cholesterol/HDL ratio are used.
- WSTF: Forms were mentioned during our phone conversation, but no copies were received. It is presumed that WSTF uses the same forms as are used at JSC.

## **Summary**

Eight different, widely varying forms were received from nine locations for review. Two other locations indicated that they used some type of HRA, but failed to send copies. No Clinics are using HRAs routinely. No HEP is focusing on "at risk" employees.

## **KSC Program**

KSC has recently introduced a program that provides risk assessment from the information obtained in the Physical Exam Program. Automated interpretation is possible. Data are basic, useful, and readily available and can be scanned for analysis. The necessary information can easily be collected from every Federal Employee Health Program Exam. The cost would be negligible. The HRA would help to identify employees that might benefit from a focused HEP. Representatives from the NASA KSC Biomedical Office and the BOC Occupational Health Clinic will present a review and details of the KSC HRA and mechanism for obtaining the risk data for automated analysis.

## SESSION IV

### **Kennedy Space Center Coronary Heart Disease Risk Screening Program**

**David A. Tipton, MD, MS and Philip J. Scarpa, MD, MS**  
Biomedical Office, Kennedy Space Center

#### **Introduction**

The number one cause of death in the U.S. is coronary heart disease (CHD). It is probably a major cause of death and disability in the lives of employees at Kennedy Space Center (KSC) as well. The KSC Biomedical Office used a multifactorial mathematical formula from the Framingham Heart Study to calculate CHD risk probabilities for individuals in a segment of the KSC population that required medical evaluation for job certification. Those assessed to be high-risk probabilities will be targeted for intervention.

#### **Background**

Every year, several thousand KSC employees require medical evaluations for job related certifications. Most medical information for these evaluations is gathered on-site at one of the KSC or Cape Canaveral Air Station (CCAS) medical clinics.

The formula used in the Framingham Heart Study allows calculation of a person's probability of acquiring CHD within 10 years. The formula contains the following variables: Age, Diabetes, Smoking, Left Ventricular Hypertrophy, Blood Pressure (Systolic or Diastolic), Cholesterol, and HDL cholesterol. The formula is also gender specific. It was used to calculate the 10-year probabilities of CHD in KSC employees who required medical evaluations for job certifications during a one-year time frame. This KSC population was profiled and CHD risk reduction interventions could be targeted to those at high risk. Population risk could also be periodically reevaluated to determine the effectiveness of intervention.

#### **Conclusions**

A 10-year CHD risk probability can be calculated for an individual quite easily while gathering routine medical information. An employee population's CHD risk probability can be profiled graphically revealing high risk segments of the population which can be targeted for risk reduction intervention.

The small audience of NASA/contractor physicians, nurses and exercise/fitness professionals at the breakout session received the lecture very well. Approximately one third indicated by a show of hands that they would be interested in implementing a similar program at their NASA Center. Questions were asked pertaining to standardization for age, the validity of using the idealized male values also for the female population, and indications of the screening test's sensitivity and specificity.

## SESSION V

### Industrial Hygiene Issues

**Steven G. Brisbin, MS**  
Environmental Health Officer  
Kennedy Space Center

This breakout session is a traditional conference instrument used by the NASA industrial hygiene personnel as a method to convene personnel across the Agency with common interests. This particular session focused on two key topics, training systems and automation of industrial hygiene data.

#### **EPA Training System**

During the FY 98 NASA Occupational Health Benchmarking study, the training system under development by the U.S. Environmental Protection Agency (EPA) was deemed to represent a "best business practice." The EPA has invested extensively in the development of computer based training covering a broad range of safety, health and environmental topics. Currently, five compact disks have been developed covering the topics listed below.

- Safety, Health and Environmental Management Training for Field Inspection Activities
- EPA Basic Radiation Training Safety Course
- The OSHA 600 Collateral Duty Safety and Health Course
- Key program topics in environmental compliance, health and safety

Mr. Chris Johnson presented an overview of the EPA compact disk-based training system and answered questions on its deployment and use across the EPA. This training system has also recently been broadly distributed across other Federal Agencies.

The EPA training system is considered "public domain" and, as such, is available to NASA at no cost in its current form. Copies of the five CD set of training programs were distributed to each NASA Center represented in the breakout session.

Mr. Brisbin requested that each NASA Center review the training materials and determine whether there is interest in using the materials as it is or requesting that EPA tailor the training modules to suit NASA's training program needs.

## **Safety and Health Program Automation**

The Safety, Health and Medical Services organization at Ames Research Center has completed automation of several key program areas. Mr. Patrick Hogan, Safety Program Manager for Ames Research Center, presented a demonstration of the automated systems, which are described below.

- **Safety, Health and Environmental Training**  
This system includes an assessment of training needs for every NASA Center organization, course descriptions, schedules and automated course scheduling, and presentation of training program metrics.
- **Safety and Health Inspection Information**  
This system documents the findings from each facility inspection, tracks abatement status on those findings and presents metrics on each department for senior management review.
- **Safety Performance Evaluation Profile**  
The survey system used by NASA to evaluate employee and supervisory perceptions of safety programs is automated in this system.
- **Documentation Tracking System**  
Electronic archive and retrieval of all correspondence and technical reports generated by the Safety, Health and Medical Services Office are provided by this system.

Mr. Hogan offered assistance to any NASA Center interested in the Ames Research Center approach to program automation and documentation. He may be reached at (650) 604-3354.

## POSTER PRESENTATIONS

For the first time ever at an annual NASA Occupational Health Conference poster presentations were incorporated into the agenda for the 1997 Cleveland Conference. This innovation met with considerable success. Approximately 24 authors submitted abstracts and followed through with well-executed displays of relevant, timely, and instructive topics. Interest by attendees was evident as they visited the displays, discussed the posters with authors, and supported the concept. A panel of peer judges selected a “best poster” for an appropriate award, which was given to the author at the Conference Banquet.

This precedent led to a similar number of posters displayed at this year’s Orlando Conference. Again excellence was exhibited by the choice of topics in multiple disciplines and from different NASA centers. Two poster awards were granted. The presentations are documented herein to archive the complete Conference agenda in these *Proceedings*.

# SSC Environmental Health Project Program

Denise C. Brever, CIH  
Johnson Controls Inc.  
Stennis Space Center

## Background

The Facility Operations and Support Services Contract Environmental Health Office provides Environmental Health service to all groups at Stennis Space Center. Over the past four years, we have grown from a staff of five to a staff of nine. We have gained three Environmental Engineers and an Environmental Health Specialist. In addition, our cost plus contract was converted to a performance-based contract in August 1997. These factors coupled with an overall desire to operate more efficiently prompted us to improve our record keeping systems.

## Intent

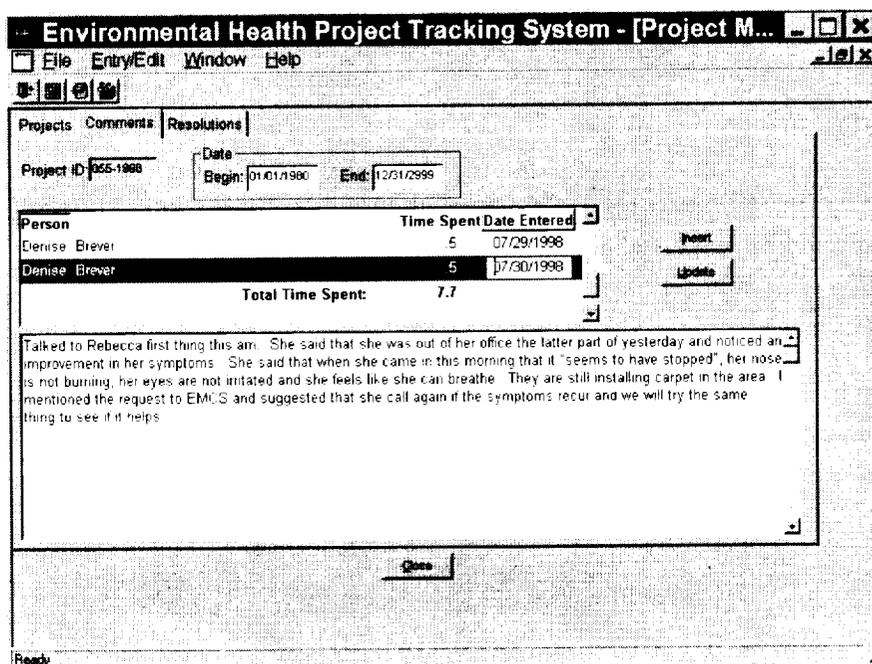
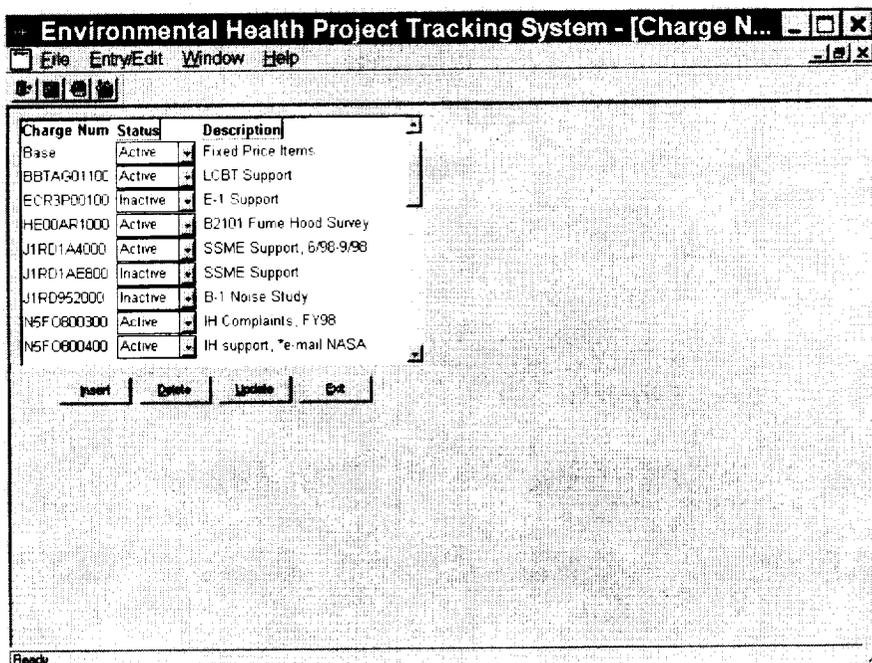
To demonstrate the capabilities and benefits of a customized automated information tracking system for Environmental Health data. (This system was presented during the Environmental Health Program Manager's ViTs on April 20, 1998. Since the graphics were not very clear for the other Centers, we want to re-present this information to participants at the 1998 NASA Occupational Health Conference.)

## Methodology/Data

Demonstration of our Environmental Health Project (EHP) tracking program through the use of printed screen images with captions describing our documentation process. We will also provide a list of the benefits that we have derived from using this system.

Project #	Project Type	Crew/Bldg	POC Agency	Start Date	End Date	Charge Number	Status	Complied	POC Name	POC
081-1998	Misc	MISC	NASA	06/23/1998	00/00/0000	Base	Open	No	R Magee	(228)
082-1998	Organic Vapors	C3872	JOWS	07/01/1998	07/01/1998	Unfunded	Open	No	S Langkate	(228)
083-1998	Asbestos	B1200	JOWS	07/08/1998	00/00/0000	Base	Open	No	J Becker	(228)
084-1998	Veratation	B1105	EPA	07/31/1998	00/00/0000	PM00581500	Open	No	C Bvink	(228)
085-1998	Asbestos	B2104	JOWS	07/14/1998	00/00/0000	N570801401	Open	No	E H	(228)



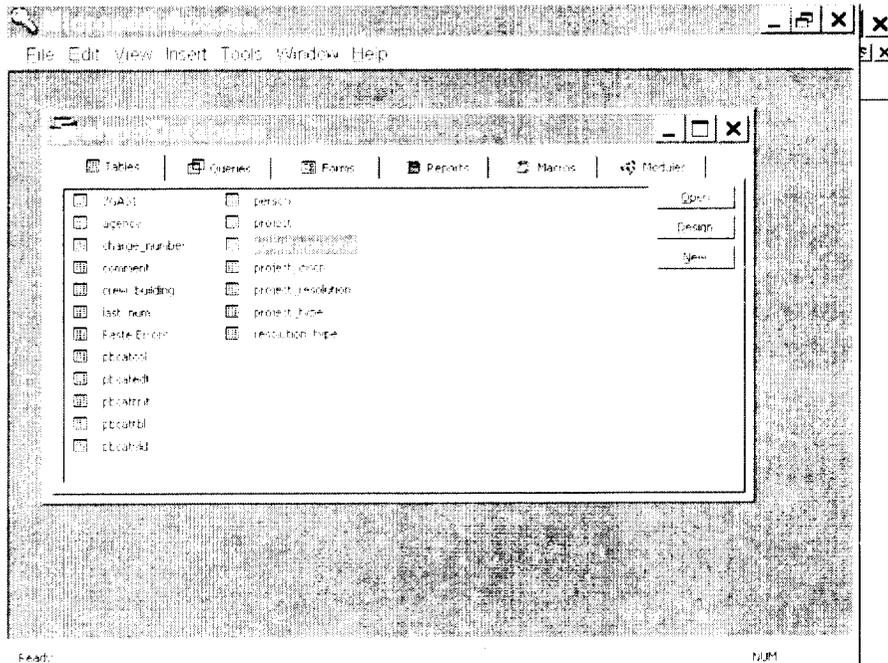


## Advantages of COMMENTS Section

- Allows us to add a wide variety of data, unconstrained by field size or data type.
- Information is immediately available to everyone in the group. If one person is out, someone else can reference his notes and carry on project activities.
- Can use this field to reference project related data such as material request numbers or work order numbers resulting from referral to other groups for support.
- Collection of level of effort data.

## Project Resolution Entry

- Resolution type is a drop down field. Allows standardization of data.
- Resolution Action Description is a unrestrained narrative of the project close-out information.



## Information Storage

- All of the data entered into EHP is actually stored in a Microsoft ACCESS database.
- Since ACCESS is user friendly, a non-program minded EH person is able to generate simple queries and reports to get information as needed.
- In addition, since this is a widely recognized and used software application, historical data integrity should be easily maintained during future upgrades of this software.

## Benefits

- Comprehensive data collection system. Organizes field data in a way that significantly reduces retrieval time.
- Provides an efficient mechanism for tracking PBC related project efforts.
- The time required to develop workload data and metrics is significantly reduced.
- Information is readily available to everyone in the EH office.
- Since this system was based upon an existing paper and pen system, it was an easy transition and there is continuity for information retrieval.

## **Weaknesses**

- It takes time and discipline. Data integrity and completeness depend upon the quality of input efforts. Even though we began using this system almost a year ago, we have not developed the discipline required to enter data daily. This leads to gaps in the available information.
- Being a computer-based system, there is the potential for electronic “hiccups” which could lead to a loss of data. Therefore, it is important to keep back-up copies of the electronic files, as well as printing and filing a paper copy of the project information at project completion.
- 

## **Future Improvements**

- Link existing ACCESS database of sampling records with EHP database.
- Develop reporting system with integrated information. This will reduce overall reporting time.
- A small list of aesthetic and organization changes such as having “inactive” charge numbers displayed separately from “active” charge numbers.

# MSFC Respiratory Protection Services

**James P. CoVan**

Environmental Health Services Manager  
Marshall Space Flight Center

## Introduction

An overview of the Marshall Space Flight Center Respiratory Protection program is provided in this poster display. Respiratory protection personnel, building, facilities, equipment, customers, maintenance and operational activities, and Dynatech fit testing details are described and illustrated.

Two AJT Respiratory Services technicians annually service more than 1000 NASA and Army Redstone Arsenal user personnel, as shown in this table.

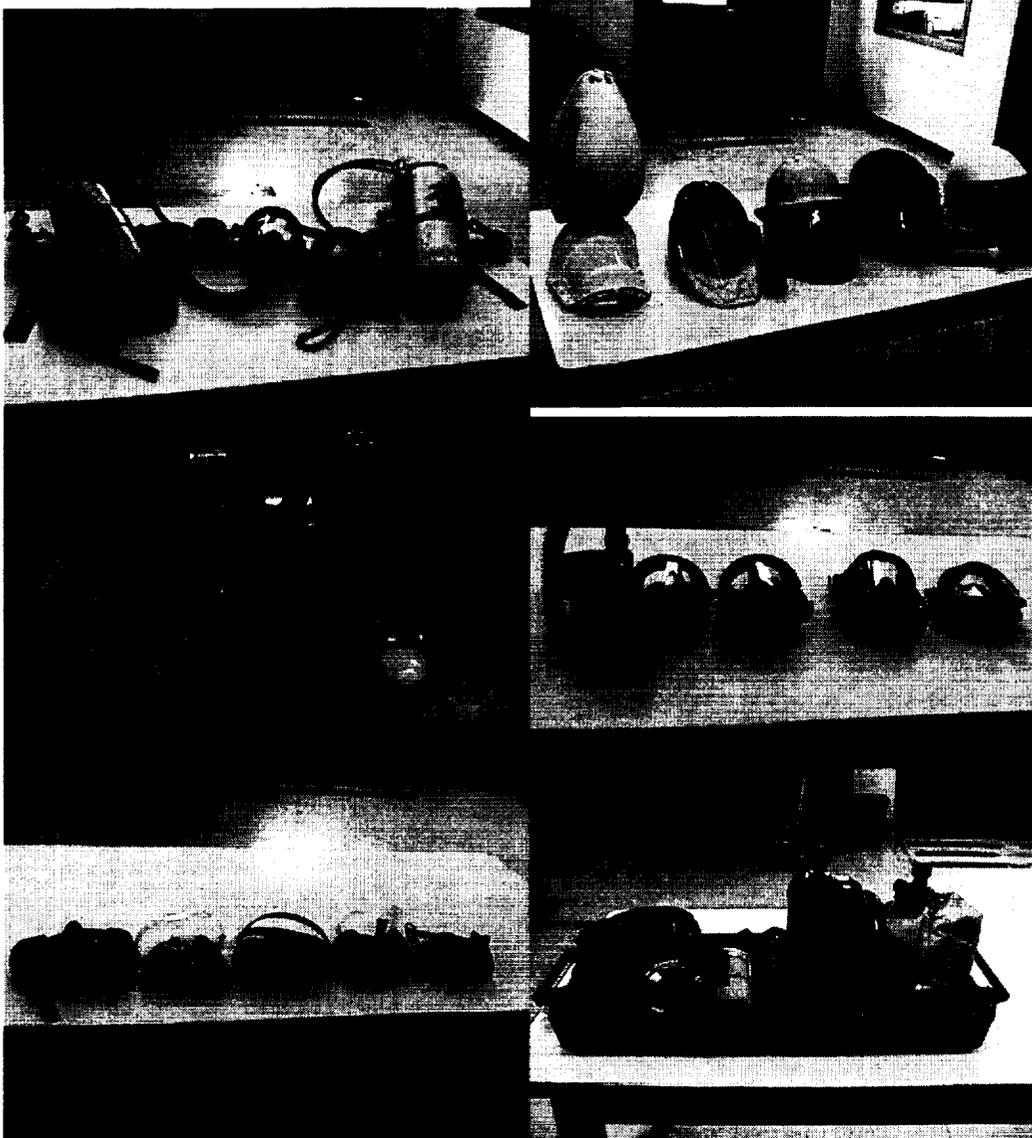
NASA	ARMY	FIREMEN
944	54	39

The MSFC Facility 3000 SF is used for training, fit testing, inspection, cleaning, maintenance, charging, storage, and offices. The following two figures show the Dynatech® system which rapidly tests the user's face piece.



## Respiratory Protection Equipment

Respiratory equipment includes Self-Contained Breathing Apparatus (SCBA), Supplied Air Helmets and Hoods, Powered Air Purifying Respirators, Cartridge Respirators, and Escape Units. The following six photographs depict various configurations of the respiratory protection equipment in service.



## Equipment Servicing Operations

Some of the equipment servicing operations is shown in these photographs.

Respirator face pieces are cleaned in a special washer and air dryer.



SCBA regulator flow testing is a typical maintenance task.



Field inspections are done at many sites throughout thousands of acres.



# **Self-Disclosure as a Predictor of EAP Supervisory Utilization**

**Timothy L. Donohoe, MS, LPC,**  
EAP Coordinator, Stennis Space Center  
**James T. Johnson, PhD and Joanne Stevens, EdD**  
University of Southern Mississippi  
**Maurice A. Taquino, MD**  
Medical Director, Stennis Space Center

## **Introduction**

The value of Employee Assistance Programs (EAPs) has been cited in a variety of published papers and articles. An important managerial element relative to the assessment and referral of troubled employees has been supervisory training. There has been numerous studies highlighting the various factors and circumstances associated with supervisory behavior and EAP referrals. The inclusion of emotional awareness factors in EAP supervisory utilization has not been thoroughly investigated, although frequently found in the literature as a training and development objective for managers in business and education. The present study sought to determine what role supervisory denial and anxiety avoidance plays in confrontation of troubled employees and if admission of specific, internal emotional events is a characteristic among EAP utilizing supervisors.

## **Method**

Eighty-nine (n=89) male and female supervisors participated in supervisory training. The measurement instrument consisted of 23 items and was presented on paper in a multiple-choice and true-false test format. Eighteen items measured content ranging from a) general knowledge concerning chemical dependency, b) the legal/ethical/practical reasons for making an EAP referral, and c) employees' job performance and mechanisms of referral. The remaining five items addressed personal opinion and awareness of subjective anxiety states relative to confrontation of problem employees. The Cronbach alpha internal consistency was 0.70. The instrument was administered before the training (Pre-test), immediately after the training was completed (Post-test), and at six months subsequent to the training (Delayed Post-test). Information regarding the number of referrals made to the EAP, and subjective benefits from training was collected at the Delayed Post-test period. Seventy supervisors returned the Delayed post-test instrument, while 19 supervisors were dropped from the study due to non-participation at the Delayed Post-test measurement period.

The criteria selected for inclusion in the EAP Utilizing group was based upon endorsement of specific items: a) having received EAP training at least once, b) having referred to the EAP for a professional or personal concern, and c) self-disclosure of anxiety or apprehension as it relates to assessing employees' declining job-performance, recognizing the need for confrontation of an employee, and actual supervisory intervention. At Post-test, thirty supervisors (n=30, 20 males and 10 females) were considered as EAP Utilizing supervisors, while forty (n=40, 37 males and three females) were grouped as EAP Non-Utilizing. Comparisons between the two groups were made on overall scoring on the assessment instrument.

## Results

Table 1 displays the means and standard deviations for the EAP Utilizing and EAP Non-Utilizing groups at Pre-, Post-, and Delayed Post-test on overall scoring

**Table 1**  
Means and Standard Deviations for EAP Utilizing and EAP Non-Utilizing supervisors on overall scoring at Pre-, Post-, and Delayed Post-test

<u>Pre-test</u>	<u>EAP Non-Utilizing</u>	<u>EAP Utilizing</u>
Mean	11.1	13.8
Standard Deviation	2.42	2.32
<u>Post-Test</u>		
Mean	16.4	17.3
Standard Deviation	1.61	.915
<u>Delayed Post-test</u>		
Mean	14.1	15.8
Standard Deviation	2.04	1.51

Table 2 displays a two way mixed analysis of variance (ANOVA) yielding significant differences between the two groups at all three measures. The EAP Utilizing group scored significantly higher at all three test periods than the EAP Non-Utilizing group.

**Table 2**  
Two Way Mixed Analysis of Variance (ANOVA) on overall scoring between EAP Utilizing and EAP Non-Utilizing groups at Pre-, Post-, and Delayed Post-test

	<u>Sum of Squares</u>	<u>df</u>	<u>Mean Sq.</u>	<u>F</u>	<u>Prob</u>
Between Subjects	159.5	1	159.91	20.95	.0001
EAP Utilizing	517.66	68	7.61		
Within (Utilizing)	666.57	2	333.29	202.93	.0001
Within Subjects Tests	29.79	2	14.90	9.07	.0001
Tests x Utilizing Residual	223.36	136	1.64		

## **Discussion and Conclusions**

At Delayed Post-test, 100% of the EAP Utilizing group reported that intervening on a performance problem before it worsens was a primary supervisory responsibility, and 70% claimed responsibility for experiencing anxiety associated with confrontation and subsequent referral of their employees. While 97% of the EAP Non-Utilizing group reported that intervening on a performance problem before it worsens was a key management responsibility, 72% denied experiencing any anxiety when confronting an employee. Furthermore, 28% admitted having someone currently in their department with job performance-based problems severe enough to warrant an EAP referral. In conclusion, this finding suggests that confrontation of an employee is a very internal, private event for each supervisor, further indicating that those supervisors who are willing to self-confront are more likely to have the internal skills and abilities to confront their employees with poor performance. The authors reason that there are a multitude of factors that can produce supervisory anxiety associated with confrontation of an employee; however, the predictive element that seems to stand alone between these two groups is that the EAP Utilizing group self-discloses, while the EAP Non-Utilizing group denies experiencing anxiety. The present study provides a stimulus for more exploration into supervisory denial, self-disclosure and negative reinforcement associated with anxiety reduction, employee confrontation, and EAP referral.

This article appears in Volume 14, No. 2 1998, *Employee Assistance Quarterly*.  
References are available upon request.

## **Predicting Return to Work in Patients with Coronary Heart Disease**

**M. Rony Francois, MD, MSPH and Patricia David, MD**  
University of South Florida

### **Abstract**

The prevalence of coronary heart disease in the United States is estimated at 13.49 million. It remains the leading cause of death, claiming 489,970 lives in 1993. The incidence of acute myocardial infarction is 1.5 million cases per year. Successful return to work by patients following a myocardial infarction (MI) could recuperate lost income, improve workplace productivity, and decrease the cost associated with cardiovascular diseases. The ability to predict return to work would thus allow a more efficient use of increasingly limited resources.

The purpose of this thesis was to design and test a new tool that physicians and others could use to more accurately assess the prospect of a person returning to work after a myocardial infarction. This new tool was based upon two previous scales (Jezer, 1959 and Schiller, 1971) and a literature review. To assess its validity, this scale was tested on 81 post-MI patients at the Bay Pines Veterans Hospital. They were surveyed by phone and/or had their charts reviewed. The patients were asked to answer 13 questions in the survey. The factors assessed included: age, current episodes of angina, working status at time of MI, educational level, perception of health, physical demands of their previous job, co-morbidity, disability/pension/social security benefits, sex, psychological status, cardiac rehabilitation participation, duration of angina, and current working status. For each factor, a numerical value of 0, 1, or 2, was assigned based on the patient's answer. These value changed for age (0, 1, 4) and sex (0, 2). Each patient thus had a total score and was placed in one of four categories (I-IV).

A 4x2 table was generated with two columns of working and non-working individuals. Four rows depicted categories I to IV. Each cell contained the number of patients falling into that Category and working status. A Chi square test was conducted to determine whether the various Categories indeed predicted the patients' current working status. At a p value of .05, the Chi square of 42.60 was statistically significant and the null hypothesis that the categories were unrelated to return to work was rejected. A t-test was then conducted to compare the mean scores of patients presently working versus those not currently working. At a p value of .05, and a critical t of 2.0, the obtained t value of 7.36 was statistically significant and the null hypothesis was again rejected. The 95% confidence interval was calculated to be 4.29 to 7.49. In other words, the total score of the patients who were not working was 4 to 7.5 points higher than those currently working.

A regression analysis revealed that the full model of the predictive rating scale had an overall accuracy of 95.06%. A backward elimination procedure identified current angina, baseline employment status, co-morbidity, and benefits as the key predictors of successful return to work. A model based only on these variables was also 95.06% accurate in its predictive accuracy.

This rating scale appears to be a valid tool in the prediction of return to work in patients with coronary heart disease. Testing of this scale on a larger sample of female and male patients will help establish its validity and assess its reliability.

## **Materials and Methods**

### **Patient Sample**

A pilot study was undertaken to evaluate the validity of this updated, modern predictive rating scale. It was tested on 81 patients who are presently enrolled in an ongoing clinical trial, Cooperative Study 387 (Appendix IV) at the Bay Pines Veterans' Hospital in St. Petersburg. This trial had set out to demonstrate that the combination of oral anticoagulation and antiplatelet therapy (combination chemotherapy) is superior to aspirin alone (monotherapy) in reducing overall mortality following an acute myocardial infarction. All patients were screened and entered into the study within 14 days after their acute MI. Of the original 110 patients, 24 had passed away and 5 had been lost to follow-up. The available group consisted of 79 men and 2 women.

### **Methods**

Patients were interviewed by telephone (59 cases) and/or had their charts reviewed with the nurse case manager (20 cases). A completed questionnaire was obtained on a total of 81 post-MI patients (Appendix V). To reduce the possibility of interviewer bias, the investigator conducted all the interviews. They all began with my identification as a resident physician working at the Bay Pines VA. Patients were assured of the strict confidentiality of their identity as well as the information about to be obtained. None of the patients reached declined the interview. They were made aware that refusal to participate would not have any repercussion on their participation in the VA Cooperative Study 387, nor would the information be used in evaluating them for disability.

The updated predictive rating scale (Appendix III) was developed after consulting the 2 previous scales and performing a comprehensive, thorough review of the literature. It contains 12 variables: age, angina at the present time, working status at the time of the MI, educational level, perception of health, physical demands of the previous job, co-morbidity, disability / social security / pension benefits, sex, psychological status, participation in cardiac rehabilitation, and duration of the history of angina at the time of the MI. For each variable, a score of 0, 1, 2, or 4 was given based on the patient's response. A total score was obtained on each patient and was used to assign them to one of 4 Categories: Category I (0-4 points), Category II (5-8 points), Category III (9-13 points), Category IV ( $\geq 14$  points).

Category I had an Excellent prognosis for return to work, Category II had a Good prognosis. Categories III and IV respectively had a Doubtful and Poor prediction for resumption of employment.

The patients were all asked the same close-ended questions (Appendix III). In addition, return to work, the outcome of interest was always assessed last. The physical demands of their previous job were ascertained using with the same objective guidelines (Appendix VI) for all the patients. The patients were also kept unaware of the specific hypotheses under investigation.

## Results

### Descriptive Statistics

The average age of the patients was 64.6 years, ranging from 42 to 85. The average total score obtained on the scale was 11, with a range of 2 to 22 points. Forty-two percent of the patients were older than 68. In that group, 91% stayed out of the workforce following their MI. In those less than 55 years of age, however, only 24% resumed employment. Only one patient who scored more than 12 points returned to work.

Forty-eight percent of the group was employed when they had their MI. Only 26% of the total sample resumed work after their myocardial infarction. Of those with a job prior to their heart attack, only 53% went back to work. However, in the group that returned to work, 95% were employed before the MI.

### Chi Square

A 4x2 table was created, with two columns of the number of patients working and not working, as well as four rows of Categories I-IV. As noted, the scale accurately predicted return to work 100% of the time in patients with a score of 0-4 or Category I, 76% of the time in those with 5-8 points or Category II, 86% of the time in Category III patients with a score of 9-13, and 100% of the time in those who scored over 14 points in Category IV.

**Table 1. Chi Square 4x2 table**

	<b>Working</b>	<b>Non-Working</b>
Category I	3	0
Category II	13	4
Category III	5	32
Category IV	0	24

At a p value of .001, a Chi square of 42.56 was obtained and statistically significant at the p value specified. The null hypothesis that the Categories or the total score the MI patients received on the predictive rating scale were unrelated to their resumption of employment was thus rejected.

### **t-Test**

A t-test was also conducted on the data in order to compare the post MI mean scores between the working and the non-working group. The average score for the patients who resumed employment was 7 compared to 13 points for those who did not return to work. A value of 7.33 was obtained. For a p value of .05, a critical t value of + or – 2 was found. Consequently, the null hypothesis that the mean scores obtained by working and non-working post MI patients does not differ, was rejected.

To determine the magnitude of this difference observed in the mean score of the two groups, a 95% confidence interval was calculated to be 4.29-7.49. In other words, on the average, the patients who did not return to work scored 4.29 to 7.49 points higher on the predictive rating scale than those who resumed employment after their acute myocardial infarction.

### **Regression Analysis**

A regression analysis on the full model revealed that it had a predictive accuracy of 95.06%. The model successfully predicted the resumption of employment in 20 of the 21 patients who went back to work. In the group that did not resume work, the scale accurately forecast 57 out of 60 patients.

A backward elimination procedure was then conducted to determine whether some variables could be deleted without affecting the overall predictive accuracy of the rating scale. This shorter model contains only 4 variables: angina at the present time, employment status at the time of the MI, co-morbidity, and benefits. Its accuracy remained at 95.06%. This smaller model successfully predicted resumption of employment in 19 of the 21 patients who returned to work. In the group that did not return to work, the model accurately forecast the work status of 58 patients out of 60.

### **Evaluation of the Validity of the Instrument**

The sensitivity and specificity of the instrument were calculated to further determine its validity. These calculations reveal a sensitivity of 73% and a specificity of 93% when Categories I and II are used as positive and Categories III and IV as negative (Strategy A recommended for general use). If Categories I-III are labeled positive, then the sensitivity increases to 100% and the specificity decreases to 40% (Strategy B). The sensitivity decreases to 14% and the specificity increases to 100% when only Category I is considered positive (Strategy C).

### **Evaluation of the Yield of the Instrument**

The positive predictive value in the recommended strategy A was found to be 80% and the negative predictive value was 92%. In Strategy B, the calculations reveal a positive predictive value of only 37% but a negative predictive value of 100%. Last, the values obtained in Strategy C were 100% and 82% for the positive and negative predictive values, respectively.

## **Conclusion**

As the 21<sup>st</sup> century approaches and the cost of healthcare in the United States continue to increase, the reality of serious rationing of services may be inevitable. In addition, with a substantial growth in the population over 65, and the shrinking Medicare budget, the ability to predict resumption of employment may become a determinant factor in the allocation of increasingly limited services such as cardiac and occupational rehabilitation. It may also result in a decrease in awarded benefits, as they seem to erode any motivation for return to work in patients who are not disabled, and who could certainly help recuperate some of 151 billion dollars spent annually for cardiovascular diseases.

## **A Follow-up Study of Ergonomic Evaluations Performed at KSC/CCAS in 1997**

**Bart Geyer**

EG&G Florida, Inc., Kennedy Space Center

### **Introduction**

As awareness concerning ergonomics has increased, injuries resulting from ergonomic hazards are becoming more recognized in the Kennedy Space Center (KSC) and Cape Canaveral Air Station (CCAS) workplace. This increased awareness has led to greater numbers of KSC/CCAS personnel reporting to KSC medical facilities with symptoms related to ergonomic problems in their workplace. In response to these medical visits, the Base Operations Contractor (BOC, EG&G Florida Inc.) Industrial Hygiene (IH) Office initiates an ergonomic evaluation of the patient's workplace. In the 1997 calendar year, the EG&G IH Office completed 72 ergonomic workplace evaluations. Following these evaluations, recommendations were provided to the employee on how to minimize or eliminate ergonomic hazards at their workplace.

For this study, a follow-up evaluation was performed on the 72 personnel evaluated in 1997. The follow-up entailed: (1) determining if improvements had been implemented to alleviate or correct the identified ergonomics hazards(s); (2) determining if those improvements were effective; and (3) identifying various trends in the implementation of the recommendations provided at the completion of the evaluations.

The objective of this study was to aid the BOC IH Office in developing a focused ergonomic program management plan and associated program implementation strategies, which would reduce the number of ergonomic injuries and minimize ergonomic hazards at KSC and CCAS.

### **Background**

During each ergonomic evaluation performed in 1997 by the BOC IH Office, ergonomic risk hazards were identified and recommendations were provided to minimize or eliminate hazards that were identified. As part of each survey, a checklist was completed to identify if the job was a "**problem**" or "**non-problem**" job. Whether it was determined to be a problem job or not, recommendations were provided to the employee to minimize or eliminate the identified ergonomic risk factors. Personnel evaluated included: electricians, janitors, computer service personnel, accountants, secretaries, roads and grounds personnel, etc., and included personnel from all KSC/CCAS contractors and Government agencies.

## Methods of Investigation

During the initial ergonomic evaluation, the applicable Occupational Safety and Health Administration (OSHA) checklists published in the 1995 proposed OSHA Ergonomic Standard were scored to determine if the job was a **problem** job. For the follow-up evaluation, all personnel evaluated in 1997 were contacted and asked specific questions in order to determine the effectiveness of the evaluations in minimizing or eliminating the identified hazards. Personnel were asked the following questions:

1. Were the ergonomic recommendations provided to you in your initial evaluation implemented?
2. If they have not been implemented, why have they not been implemented?
3. Is your job still causing or aggravating the symptoms that prompted you to originally visit KSC medical facilities?

## Data and Results

1. Of the 72 jobs that were evaluated, 32 (44%) were determined to be **problem** jobs (as defined by 1995 OSHA proposed standard). The remaining 40 (56%) were determined to be non-problem jobs. In the proposed OSHA Ergonomic Standard, OSHA recommended fixes be made to any job which was scored as a **problem**. Recommendations were given to personnel at the conclusion of all 1997 evaluations to minimize or eliminate the identified ergonomic hazards present.
2. Of the 72 people with jobs that were evaluated, 59 were successfully contacted for the follow-up evaluation. The remaining 13 people were either laid-off, retired, on medical leave, or had changed jobs. Of the 59 people contacted for the follow-up, 46 (78%) had implemented all or a portion of the recommendations provided to them during their initial survey.
3. Of the 46 people that implemented the provided recommendations, 33 (72%) indicated that the original injury problems had either dissipated or improved.
4. Of the total group of 59 people that were contacted, 22 (37%) said that the original problems still existed. Thirteen of the 22 indicated that they did not implement the recommendations provided to them during their initial survey. Of those people who did not implement the recommendations, 9 (69%) stated that the original problems still existed, compared to 13 of 46 (28%) who implemented the recommendations.
5. A large number of people stated in the follow-up evaluation that they had difficulties in procuring equipment that was recommended during the initial evaluations. The recommended equipment was not obtained, either because of lack of management support, lack of knowledge on how to properly submit the necessary documentation to procure the equipment, or because they simply did not follow through with the recommendation.

## Conclusions

Based on the results from the follow-up study, the following conclusions were developed:

1. The potential exists for a significant number of jobs at KSC/CCAS to be evaluated as **problem** jobs, as defined by OSHA in their proposed standard. Thus, more attention by personnel in the BOC medical Office, BOC IH Office, and other KSC/CCAS Safety and Health organizations should be devoted to preventing ergonomic type injuries.
2. Ergonomic hazards can be minimized or completely abated, if recommendations that are provided are implemented following a proper ergonomic evaluation.
3. Minimal attention and efforts have been placed on preventing and assessing ergonomic problems at KSC and CCAS. Preventative efforts could include procuring proper ergonomic equipment, such as tools, desks, chairs, waste receptacles, brooms, etc., and correctly designing new work processes. The rate of ergonomic injuries should decrease if ergonomically correct equipment is procured and made available to employees, and if processes are designed with ergonomic considerations in mind.

## Recommendations

1. Since ergonomics is a widespread occupational health problem at KSC/CCAS affecting personnel of all job types, the BOC IH Office must maximize its ergonomic efforts by more effectively using the limited amount of IH resources allocated to ergonomics.
2. Based on the fact that ergonomics is an occupational health problem at KSC, an ergonomic management plan should be developed by NASA/AF and their support contractors which incorporates a mission statement, objectives, and implementation strategies designed to meet objectives.
3. Based on the reality of limited resources, the BOC IH Office developed a number of strategies that will affect a maximum number of KSC personnel while utilizing a minimum of IH resources. These strategies are listed below and are in various stages of being implemented:
  - a) The BOC IH Office will utilize ergonomic screening tools (checklists, workers' compensation data, medical follow-ups, etc.) to identify specific KSC/CCAS job classifications that are of greatest ergonomic concern. This data will allow the BOC IH Office to better prioritize their ergonomic workload.

- b) One ergonomic management program implementation strategy in increasing ergonomics communication with the KSC/CCAS workforce is to use the Internet. The Internet will greatly enhance accessibility for all employees to an ergonomic information of great variety, while hopefully maximizing the BOC IH Office's efforts and limited resources. An ergonomic site was added to the BOC Environmental Health/ Industrial Hygiene Home Page. This site will include: (1) general information about the BOC IH Office's Ergonomic Program, (2) an electronic pamphlet that contains pictures of ergonomic equipment in BOC stock with instructions on how to obtain those items, (3) ergonomic training opportunities and resources for KSC/CCAS employees, (4) a computer workstation self assessment survey, (5) generic ergonomic job evaluations, and (6) links to other Internet ergonomic sites.
  - c) Due to the problems associated with procurement of ergonomic equipment recommended during ergonomic surveys, the BOC IH Office is working with the BOC cataloging department to assign federal stock numbers to office ergonomic equipment frequently recommended for use by the BOC IH Office. A small quantity of those items will be placed in bench stock. Photos of the recommended ergonomic items, assigned federal stock numbers and instructions on how to complete the necessary forms to obtain such equipment have been incorporated into a pamphlet. A similar pamphlet will be created for other NASA contractors, which have separate supply systems.
  - d) Many of the recommendations given in any particular ergonomic evaluation are applicable to a larger pool of personnel in the same job classification at KSC. Therefore, the BOC IH Office will disseminate generic ergonomic job evaluations for different classifications of personnel, such as, janitors, electricians, plumbers, secretaries, etc. via the BOC IH Ergonomic Web page.
  - e) A computer workstation self assessment form is being developed for broadcast on the Internet, in order to identify KSC job classifications with the highest identified ergonomic risk. The data produced from the form will help the BOC IH Office to prioritize non-medical ergonomic evaluations and ensure the most hazardous areas/jobs are evaluated before less hazardous areas/jobs. Those identified groups with the highest risk will be given ergonomic training and, if necessary, work site evaluations.
4. An established follow-up procedure needs to be instituted by the BOC IH Office to facilitate the implementation of initial recommendations to minimize and eliminate ergonomic risk factors. Approximately three months after an initial evaluation is completed, the BOC IH Office should contact the employee surveyed and determine if the recommendations provided in the initial survey have been properly implemented and if another work site visit should be conducted.

## ISO Excellence at JSC

**Sheilla Goldberg, MS and Rebecca Siemens, MS**  
Kelsey-Seybold Clinic, Johnson Space Center

### Introduction

The International Organization for Standardization (ISO) is a worldwide federation of over 100 nations that create international standards. The ISO 9000 series is designed to standardize performance quality in global arenas.

When NASA Director, Daniel S. Goldin, announced in July 1996, "NASA will be in the forefront of ISO 9000 implementation within the government," Johnson Space Center (JSC) geared up for ISO certification. Foreseeing future contract requirements, the management of the JSC Occupational Medicine and Environmental Health contractor, Kelsey-Seybold Clinic, P.A., decided to also seek ISO 9000 registration of all contract departments. Goals were set by JSC and Kelsey-Seybold to be ISO certified by the end of 1997.

### Methods

ISO 9000 is a system for establishing, documenting, and maintaining a program to ensure the quality of the output of a process. It is identical in most respects to the American Standard Z90, sponsored by the American Society for Quality Control. Most companies become registered to either ISO 9001 or ISO 9002. ISO 9001, the most comprehensive part, applies to facilities which design/develop, produce, install, and service products or services to customers' specifications. ISO 9001 consists of 20 elements. ISO 9002, consisting of 19 elements, applies to organizations that provide goods or services consistent with designs or specifications furnished by the customer. The following elements comprise the ISO 9000 requirements:

**Management Responsibility (4.1)** includes having a written, signed quality policy (4.1.1). An ISO Management Representative must be designated. This person is management's liaison with employees. Management responsibilities and authorities (4.1.2.1) must be documented. A management review must be conducted at least annually to evaluate the quality program. The minutes of this management review meeting are quality records.

The **Quality System (4.2)** consists of the Quality Management Plan (4.2.3). This plan must state the company's goals and objectives to improve quality in the upcoming year. It also includes the quality manuals (4.2.2) stating what procedures are to be followed in ensure quality in all operations. Generally these manuals are broken down into three tiers. Tier I states how the company will comply with each element of ISO 9000. Tier II tells who does what, when, how, and why. Tier III gives the operational SOPs and usually consists of forms flow charts, calibration procedures, and detailed process instructions.

**Contract Review (4.3)** details how contracts are reviewed to insure adequate resources are available to provide any service requested by the customer. This section must designate who is responsible for this review and give details on how any changes to the original contract will be handled. Records of these reviews are part of the company's quality records.

**Design Control (4.4)** covers any type of design work that is part of the statement of work of the company. This element does not apply to ISO 9002.

**Document and Data Control (4.5)** is one of the most important elements of the ISO 9000 program. In this section companies must document how they will ensure that all references and documents used in the workplace are the latest revision and are up-to-date. They also document how they will differentiate between controlled and uncontrolled documents, how they will process out-of-date documents, and who is responsible for the maintenance of these documents. This section should also include a list of all controlled documents, i.e., forms, procedures, references, etc.

**Purchasing (4.6)** documents how supplies are purchased, how they are evaluated, how subcontractors are assessed, and who is responsible for ordering, evaluating, etc. There should be an approved vendors list. A written procedure should be in place to document how vendors are added and removed to the list and who is responsible for these actions. Purchasing records are considered quality records.

**Control of Customer Supplied Products (4.7)** can be tricky for NASA contractors since all supplies and equipment fall into this category. Records must be in place showing how non-conforming customer-supplied products are handled. This record should identify the non-conforming supply or equipment, who was contacted, how the problem was handled, and what problems were created by the non-conformance. These logs are part of the company's quality records.

**Product Identification and Traceability (4.8)** includes methods to identify and trace all records, materials, and analysis.

**Process Control (4.9)** establishes a consistent method of control of processes that directly affect quality of services. It identifies who is responsible for these processes and any controlled conditions. Workplace SOPs may be part of this section.

**Inspection and Testing (4.10)** documents procedures that ensure inspection and test requirements are satisfied. This section includes receiving or initial inspection (4.10.2), in-process inspections (4.10.3), and final inspections or test results (4.10.4). Records of these inspections are part of quality records.

**Control of Inspection, Measuring, and Test Equipment (4.11) and Inspection and Test Status (4.12)** include records of calibration, historical data, and documentation of the calibration status of all equipment. All equipment must be calibrated to nationally recognized standards and these standards must be documented. Instruments must be labeled as to when they were calibrated, the expiration date, and who performed the calibration. Instruments that do not need to be calibrated or are out of use must also be labeled stating these facts. Allowable tolerance ranges for equipment must be stated along with procedures detailing what actions will be taken with out-of-tolerance equipment. A nonconformance report form should be developed.

**Control of Nonconforming Product (4.13)** includes procedures detailing who will notify whom regarding nonconformity, how nonconforming services/equipment will be handled, what precautions will be taken to ensure nonconforming services/equipment will not be distributed to the customer, and how nonconformance report forms will be processed.

**Corrective and Preventive Action (4.14)** consists of procedures for initiating, implementing, reviewing, and documenting corrective and preventive actions to prevent the recurrence of nonconformances. The procedures should document who is authorized to initiate a corrective or preventive action and how they are reviewed.

**Handling, Storage, Packaging, Preservation, and Delivery (4.15)** requires procedures for ensuring, for instance, that medications have not expired; how these medications will be reviewed for potency, how they will be removed, and the review schedule. The job title of the person responsible for this review must also be stated. This section would also include distribution of reports and test results. Procedures must also be in place for securely storing and transporting medical records and controlled substances.

The **Control of Quality Records (4.16)** section requires a list of all quality records and procedures to maintain and dispose of these records. Retention time must be given along with identifying who has responsibility for maintenance and disposal.

**Internal Quality Audits (4.17)** are required at least annually for ISO 9000 certification. Non-departmental employees who have received adequate audit training must perform these audits. A documented schedule for the following year's audit must be in place along with procedures for how auditors are selected and trained, how the audit will be conducted, and how the findings are handled. Audit findings are quality records and are items for review at the management review meeting.

**Training (4.18)** must list any training required for employees, both continuing and new hires. The procedure must also address how these requirements are communicated to employees and who is responsible for this communication. Records of all required training are quality records and must be maintained accordingly.

**Servicing (4.19)** applies to operations that service or calibrate equipment for others. Procedures should be in place to document how calibrations are performed and identify that safeguards exist to ensure accurate service.

**Statistical Techniques (4.20)**, the last element, covers any statistical methods used to ensure the quality of test results and services.

The following sequence of events has proven useful in obtaining ISO 9000 certification:

- Select Implementation Team leaders and train them in ISO 9000 implementation and auditing
- Form an ISO Committee
  - Select at least one person from each area or department
  - Train committee members
- Establish and approve an implementation plan
  - Scope of registration
  - Develop and implement a quality system
  - Develop a timeline
  - Set authority and responsibilities
- Select a registrar  
Begin a dialogue with your registrar. They will answer questions and help you with problem areas.
- Complete the Tier I and Tier II manuals
  - Review the manuals with the ISO committee
  - Team members will take information back to their areas, implement the requirements of the manuals, and begin to train employees in their areas concerning the requirements.
- Update and/or create SOPs and work instructions to fit ISO Tier III format.
- Send Tier I and Tier II manuals to registrar to review and critique.
- Address nonconformances of quality manuals
- ISO Training—train all employees in ISO requirements
- Select and train internal auditors
- Perform an internal gap analysis
- System should be in place at least three months prior to final audit
- Correct nonconformances detected by the gap analysis
- Conduct the ISO Management Review Meeting
- Request a pre-audit analysis by registrar
- Correct nonconformances detected by registrar pre-audit analysis
- Request final audit by registrar for certification

## **Conclusion**

JSC and the Kelsey-Seybold Occupational Medicine and Environmental Health contract have achieved their goals of ISO registration. In December 1997 Kelsey-Seybold became registered to ISO 9002. This certification represented many firsts for ISO 9002 registration in the United States: the first full-service clinic, the first Employee Assistance Program, the first Radiological Health Department, the first Health Fitness Facility, the first Manned Test Support Group, and the first Industrial Hygiene Department. JSC achieved registration to ISO 9001 in February 1998. JSC's certification applies to all Center human space flight responsibilities, including program and project management, spacecraft engineering and design, flight crew training, space and life sciences research, and mission operations in support of NASA's Human Exploration and Development of Space enterprise.

“While many industrial companies seek ISO certification to meet business or customer demands, JSC expects the quality process to increase effective use of its resources.”-- Lee Norbraten, director of JSC's ISO 9000 office.

# Lead Poisoning in a Construction Company: Science Effecting Policy

T.R. Hales, C. McCammon, W. Daniels, S. Lee  
NIOSH, Cincinnati, OH

## Introduction

An estimated 1,000,000 construction workers are exposed to lead. Case studies and State occupational lead registries have documented the problem of lead poisoning in the construction industry. Despite this information, the construction industry has been exempt from the OSHA general industry lead standard, primarily due to economic and technical feasibility concerns.

## Study Objective

In 1991, a study of "lead burners" at a construction company in Utah was undertaken to determine:

1. Airborne lead exposures;
2. Whether adverse health effects were occurring among employees;
3. Whether this company could implement provisions of the OSHA general industry lead standard.

## Methods

*Longitudinal study:* 2 month follow-up;

*Exposure measures:* Airborne lead exposures during job tasks as an 8-hour time weighted average (TWA);

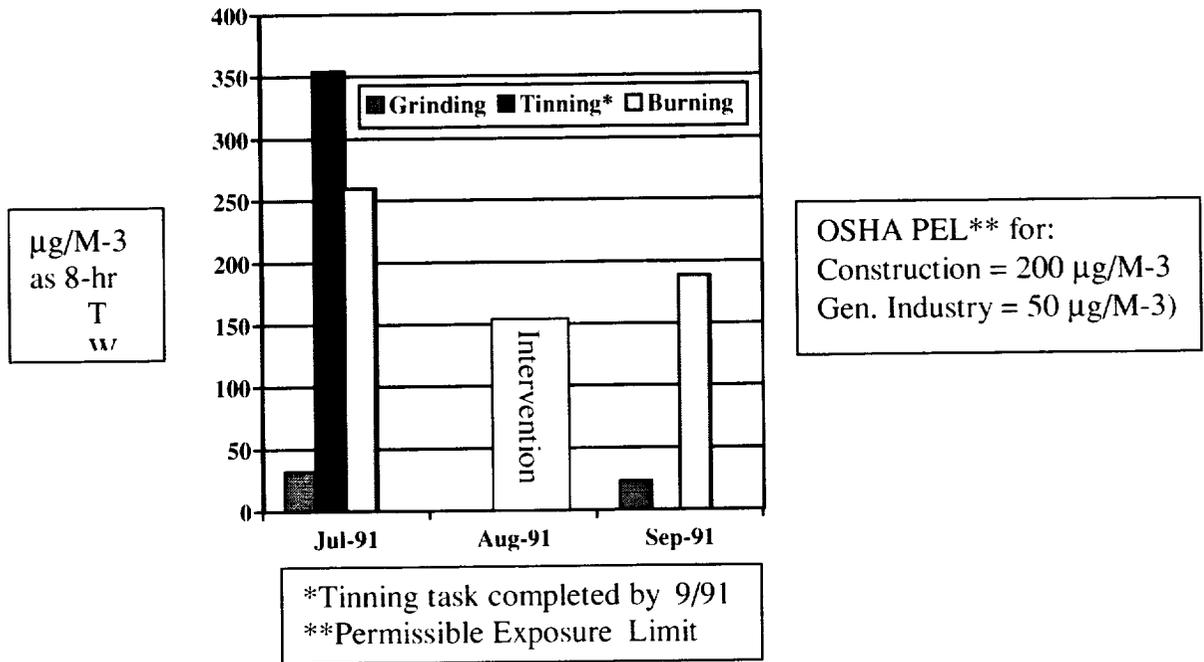
*Outcome measures:* Symptom questionnaire, gum examination for lead lines, blood pressure measurement, kidney function [spot urine creatinine clearance (CrCl)], blood lead levels (BLL), implementation of NIOSH recommendations.

## Health Effects of Blood Lead Levels (Adults)

Ug/dl	Effect
>100	Encephalopathy
>70	Peripheral neuropathy
>60	CNS, female reproductive effects
>50	GI sx, decreased hgb, neurobehavioral, [OSHA requires removal from exposure]
>40	Decreased nerve conduction, decreased renal function, increased blood pressure, [OSHA monitoring]
<25	[CDC recommends levels below 25 µg/dl]

## Results

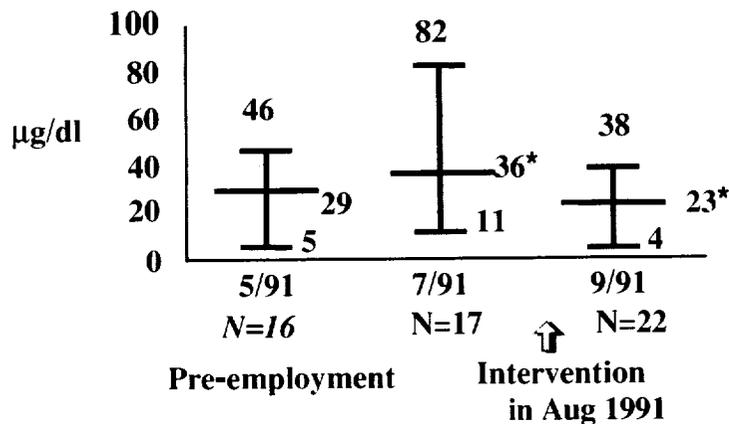
Exposure Measure: Airborne Levels by Task



## Outcome Measures

- 100% participation,
- Asymptomatic employees;
- No gum lead lines;
- Eight (36%) had elevated systolic or diastolic blood pressure at the worksite;
- Two (9%) had significantly reduced CrCl<sub>2</sub>;
- All of the NIOSH recommendations were implemented (more protective respirators, better hygiene, improved housekeeping)—bringing the company in compliance with the OSHA general industry lead standard.

## Blood Lead Levels (means & ranges)



\* p<0.01

N varies due to changing size of workforce

## **Conclusion**

Employees were over-exposed to lead;

Employees had elevated BLL;

Although asymptomatic, employees had conditions consistent with chronic lead toxicity;

This construction company demonstrated that it was economically and technically

feasible to implement provisions of the general industry lead standard;

These provisions significantly reduced employees BLL.

## **Broader Impact – Policy**

This study contributed to:

The Utah State legislature repealing the construction industry's exemption from Utah's State OSHA general industry lead standard in 1992;

Federal OSHA removing the construction industry's exemption in 1993;

Both policy's are expected to dramatically decline the problem of lead poisoning in the construction industry.

*Editors' Note: Dr. Hales submitted poster materials for the Conference. However, neither he nor his co-authors were able to attend. These poster materials are published herein for completeness of the Proceedings.*

# **The Nurse Practitioner in NASA Occupational and Preventive Medicine Programs**

**Janet Kiessling, RN, COHN-S, MSN, CRNP**  
Kelsey-Seybold Clinic, Marshall Space Flight Center

## **Introduction**

The NASA Marshall Space Flight Center has implemented a cost-effective benchmark of excellence in the integration of a nurse practitioner into the Center's occupational and preventive medicine programs. This paper defines the position of nurse practitioner and describes the versatility, value added, and cost savings achievable by employing a nurse practitioner in NASA Center medical programs.

## **Nurse Practitioner -- Definition**

A nurse practitioner is a registered nurse who has completed additional formal education and clinical training and passed a national certification examination beyond that required for the registered nurse license. Completion of the formal education and clinical training requirements is recognized through the award of a master's degree or a certificate depending on the provisions established by each state. The period for completing the course work and clinical training varies from nine to twenty-four months. A licensed nurse practitioner, working in collaboration with a physician, may legally perform many of the functions traditionally performed by physicians.

The functions performed by a nurse practitioner include assessing and diagnosing, conducting physical examinations, ordering laboratory and other diagnostic tests, and developing and implementing treatment plans for some acute and chronic illnesses. They also include prescribing most medications (the majority of states do not permit nurse practitioners to prescribe narcotics), monitoring patient status, educating and counseling patients, consulting and collaborating with other health care providers, and referring to other providers. Diagnosis and management of common acute illnesses, disease prevention, and management of stable chronic illnesses are all within the purview of the nurse practitioner.

A 1988 survey indicated that approximately 23,000 nurse practitioners were practicing throughout the United States. Since that survey, the number of nurse practitioners has continued to increase annually. Nurse practitioners practice in a variety of settings including hospitals (both inpatient and outpatient), health maintenance organizations, independent primary clinics, community public health centers, private practice offices, and managed care facilities.

## **Versatility and Value at the Marshall Space Flight Center**

At the Marshall Space Flight Center, the nurse practitioner has assumed the duties previously performed by the chief nurse and one of the staff physicians. The nurse practitioner is scheduled to conduct physical examinations throughout the day. When not conducting physical examinations she is able to see walk-in patients. During morning hours, if there are no examinations or walk-in patients, the nurse practitioner may assist the medical center nurses and technicians with the laboratory portion of the physical examination process. Open hours in the afternoon are devoted to administrative matters associated with managing the nursing staff and the overall Marshall occupational and preventive medicine program. Because the present Marshall nurse practitioner is also a Certified Occupational Health Nurse-Specialist (COHN-S), she is able to administer the Center's occupational medicine program.

This arrangement employs the full range of capabilities possessed by the nurse practitioner. Patient response has been especially positive. By virtue of her professional training, the nurse practitioner emphasizes patient counseling and patient education. Patients who depart the medical center have frequently praised these aspects of her practice. They are well pleased with increased knowledge and understanding of their particular personal health issues.

Because she directly and actively participates in every aspect of the Marshall occupational and preventive medicine program, the nurse practitioner has an in-depth overall knowledge of all clinic processes and has been able to identify and implement improvements which enhance the quality and effectiveness of clinic operations.

## **Cost Effectiveness**

The Marshall Space Flight Center occupational and preventive medicine program has experienced continued high quality health care at reduced cost as a consequence of adding a nurse practitioner to the Marshall team. Because the annual cost of a nurse practitioner is considerably less than that of a physician, the nurse practitioner can spend more time with a patient and provide greater personal attention while simultaneously achieving cost savings in comparison to previous practice. This is possible because the majority of health issues addressed by the Marshall clinic fit within the category that may be handled by either a nurse practitioner or a physician. Furthermore, the versatility of the nurse practitioner has enabled her to achieve further savings by performing the range of tasks formerly divided among two employees.

## Potential Impact of Local Fauna on Employees at the Kennedy Space Center

**George A. Martin, MD and Arthur A. Arnold, Jr., MD**  
Biomedical Office; The Bionetics Corporation, Kennedy Space Center

The John F. Kennedy Space Center is home to the 150,000 acre Merritt Island National Wildlife Refuge. This refuge has the largest number of threatened or endangered species on the continental United States, as well as hundreds of other species of animals. With over 15,000 employees engaged in numerous operations scattered throughout the wildlife refuge, there are ample opportunities for interactions with potentially hazardous species. This poster presentation examined many of these unique occupational hazards.

Common Name	Scientific Name	Potential Danger	Approximate Incidence	Intervention
Water Moccasin (Cottonmouth) Eastern Diamondback Rattlesnake Dusky Pygmy Rattlesnake Coral Snake	<u>Agkistrodon piscivorus</u> <u>Crotalus adamanteus</u> <u>Sistrurus miliarius barbouri</u> <u>Micrurus fulvius</u>	Envenomation	.5 per year	Training, PPE such as boots, emergency plans in place
American Alligator	<u>Alligator mississippiensis</u>	Mastication trauma	None known	Awareness, avoidance
New World Mice and Rats Cotton Rat Beach Mouse	Family Cricetidae <u>Sigmodon hispidus</u> Peromyscus species	Hantavirus	None known	HEPA masks and other PPE for all in contact with wild rodents
Feral Domestic Cat	<u>Felis domesticus</u>	Bites and cat-scratch fever	1 per month	Education, removal
Feral Domestic Pigs	<u>Sus scrofa</u>	Blunt trauma and bites	Rare	Education, removal
Many Mammals	Class Mammalia	Rabies ( <u>Lyssa virus</u> )	None known	Education, awareness
Sting Rays	Family Dasyatidae	Laceration, envenomation, and subsequent infection	.5 per year	Education, awareness
Sharks	Family Carcharhinidae	Bites and abrasions	None known	Avoidance
Miscellaneous Spiders	Order Araneae	Bites	4-6 per year	Education, awareness
Scorpions	Order Scorpiones	Stings	4-6 per year	Education, awareness
Mosquitos	<u>Culex species</u>	St. Louis Encephalitis	None known	Repellent, avoidance, large-scale control
Bees and Wasps	Order Hymenoptera	Stings	1 per week	Allergic reaction kits

The primary thrust of this presentation was to highlight the unique interactions that can occur between the world of the high tech, and that of the wild. Even though there was no systematic study of fauna-related injuries to Kennedy Space Center workers, several areas of potential investigation were demonstrated, which could lay the groundwork for future studies.

# **A Comparison of the Effects of Various Exercise Programs on the Reduction of Body Fat**

**Cristy L. Mathews, MS, CSCS, HFI; Chris A. Symons, BS; CSCS;  
Arthur A. Arnold, MD; Daniel Woodard, MD; Marion P. Merz, MT, ASCP;  
Barbara Deppensmith, MT, ASCP; Deborah Ghiotto, RN, NP; Cathy DiBiase, RN, BSN**  
The Bionetics Corporation, Kennedy Space Center

## **Introduction**

The interrelationships that exist between exercise and reduction of body fat have been well established. A number of studies have reported that people who exercise have a reduction in body fat. One of the studies by Ballor & Keeseey was a meta-analysis of 53 studies that looked at exercise induced changes in body composition. This study looked at aerobic exercise (walk/run & bike) and weight training and found that all forms of exercise reduced body fat.

However, much of the research does not compare different types of exercise to the greatest loss of body fat. The following study was conducted to determine the effect of specific fitness programs on body fat. The changes in body fat due to the type of activity allowed inferences to be made regarding the type of exercise program that produces the greater body fat reduction.

## **Problem Statement**

The interrelationships between exercise and the reduction of body fat have been well established. However, little research compares different types of exercise with efficacy in reducing body fat. The following study was designed to determine which type of exercise elicits the greatest loss in body fat. There are little or no studies that compare aerobic training, strength training and combination training with their effectiveness on reducing body fat.

## **Purpose**

The purpose of this study is to compare three specific exercise programs and collect data to show which program is best for the reduction of body fat.

- Strength Training
- Aerobic Training
- Combination Training

## **Subjects**

All subjects are Kennedy Space Center (KSC) employees. They participate on a voluntarily basis. The basic requirements for participation are shown below.

- Subjects have not been in a consistent exercise program in the last three years.
- Subjects may not be on any type of medication that will alter their heart rate.
- Subjects must be able to commit 45 minutes on Monday, Wednesday, and Fridays.
- Subjects must not change their eating habits or increase physical activity other than that required for study.
- Subjects must complete 72 sessions within 7.5 months, preferably within six months.
- The body fat for male subjects must be greater than 20% and the body fat for female subjects greater than 25%.

## **Methods**

An advertisement is placed in the KSC Bulletin asking for volunteers for a body fat reduction study. The prospective subjects meet together and the requirements explained. The subjects begin a series of pre-tests, which include blood work to detect any potential medical problems.

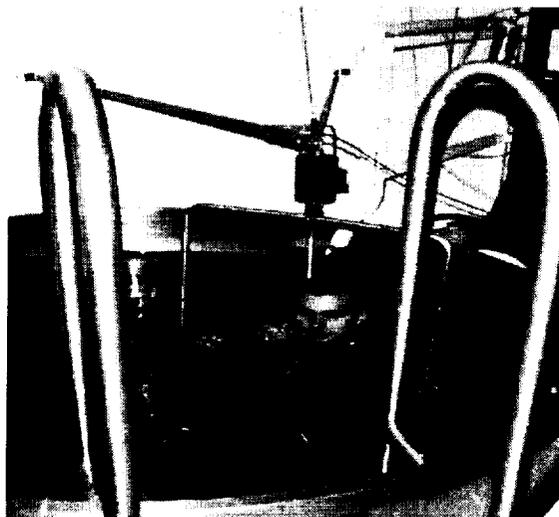


After the blood work is reviewed and approved by a flight doctor or nurse, each subject receives a general physical.

Physicals are performed by staff doctors or nurses and are required to qualify each subject for the study.



Percent body fat on each subject is calculated by hydrostatic weighing.



## **Fitness Assessment**

- Girth measurements are collected on each subject.
- An estimated VO2 max test is performed on a Cybex ergometer.
- A flexibility test is performed.
- A maximum repetition bench press is performed.
- An abdominal strength test is performed.



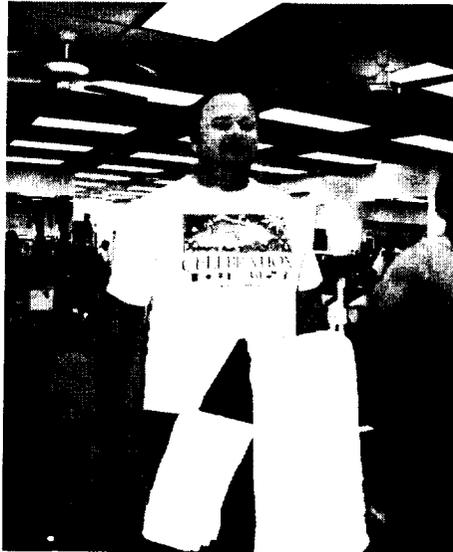
## **Strength Program**

This program includes nine exercises, four lower body and five upper body, covering all of the major muscle groups. The routine consists of three sets at 8 to 12 repetitions per exercise. Subjects are allowed five minutes per exercise. Each exercise session must be completed in 45 minutes.



## **Aerobic Program**

Subjects are required to maintain their heart rate at 65 percent of their maximum heart rate. This program requires subjects to walk on a treadmill for 45 minutes.



## **Combination Program**

Subjects perform five upper body exercises and walk for 20 minutes at 65 percent of their maximum heart rate. The next workout consists of four lower body exercises and a 25-minute walk at 65 percent of their maximum heart rate.

## **Completion of Program**

Subjects are scheduled for reevaluation at the end of the program.

Subjects will be post-tested and measured. These tests will include blood work, fitness assessments, and hydrostatic weighing. Data will be added to subject's file.

## **Results**

The seven subjects that have completed testing have had little or no change in body fat. Possible reasons that may have prevented any measurable change in body fat. All subjects admitted to possible higher caloric intake during the testing period. Some subjects did not adhere to program guidelines. To see a significant change in body fat, these individuals may require increased caloric expenditure and monitored caloric intake. Testing is still being conducted at this time.

## **Conclusion**

To improve the reliability of study data subjects may first need to submit a weekly caloric intake total. This weekly caloric intake would need to be observed during the individuals' 24-week exercise program. Due to variations in each participant's diet, motivation and consistency, more research is needed.

# **Chemical Hygiene Program**

**Antoinette C. Mayor**

Environmental Management Office

Lewis Research Center

## **Introduction**

The Chemical Management Team is responsible for ensuring compliance with the OSHA Laboratory Standard. The program at Lewis Research Center (LeRC) evolved over many years to include training, developing Standard Operating Procedures (SOPs) for each laboratory process, coordinating with other safety and health organizations and teams at the Center, and issuing an SOP binder.

## **Methods**

The Chemical Hygiene Policy was first established for the Center. The Chemical Hygiene Plan was established and reviewed by technical, laboratory and management for viability and applicability to the Center. A risk assessment was conducted for each laboratory. The laboratories were prioritized by order of risk, higher risk taking priority. A Chemical Management Team staff member interviewed the lead researcher for each laboratory process to gather the information needed to develop the SOP for the process. A binder containing the Chemical Hygiene Plan, the SOP, a map of the laboratory identifying the personal protective equipment and best egress, and glove guides, as well as other guides for safety and health.

## **Results**

Each laboratory process has been captured in the form of an SOP. The chemicals used in the procedure have been identified and the information is used to reduce the number of chemical in the lab. The Chemical Hygiene Plan binder is used as a training tool for new employees. LeRC is in compliance with the OSHA Standard.

## **Discussion**

The program was designed to comply with the OSHA standard. In the process, we have been able to assess the usage of chemicals in the laboratories, as well as reduce or relocate the chemicals being stored in the laboratory. Our researchers are trained on the hazards of the materials they work with and have a better understanding of the hazards of the process and what is needed to prevent any incident. From the SOP process, we have been able to reduce our chemical inventory, determine and implement better hygiene procedures and equipment in the laboratories, and provide specific training to our employees. As a result of this program, we are adding labeling to the laboratories for emergency responders and initiating a certified chemical user program.

# **The Employee Assistance Program and the Workplace Violence Working Group: “Benchmarking in Tierra Incognita”**

**William T. McGuire MA, CEAP**  
Administrator, Employee Assistance Program  
EG&G Florida, Inc.  
Kennedy Space Center

## **Background**

In early 1995 KSC was tasked with developing a Crisis Management Plan to address the emerging issue of workplace violence. Shortly thereafter, the bombing of the Alfred P. Murrah Government Building in Oklahoma City underscored the importance of this task.

This task was designed to be a collaborative effort involving a number of directorates and Employee Assistance Program (EAP) personnel. This event marked the first time that the EAP Program had been formally integrated into organizational planning and decision making. The team is called the Workplace Violence Working Group and has as its goal, the development of policy, procedures for reporting threats of violence, a training and information program and a threat assessment team.

## **Process**

The benchmarking process used (planning, analysis, integration, action and maturity) is explained and how the role of the EAP on the team is defined.

## **Results**

This task remains a “work in progress.” Proposed policy and procedures have been developed. The assessment team has functioned effectively in several incidents. Various training events and new technologies have been presented and evaluated by the team. The EAP has been an integral part of the process and developed a procedure for “psychological triage” as part of the crisis management plan.

## **Discussion**

The collaborative approach allowed the team to benefit from a variety of perspectives and expertise. It has greatly enhanced our understanding of what each member can contribute to the team. It was also beneficial to collaborate with other centers, agencies and companies in seeking best practices and to avoid operating in isolation.

# **The Effectiveness of an On-site Musculoskeletal Rehabilitation Program at the Kennedy Space Center**

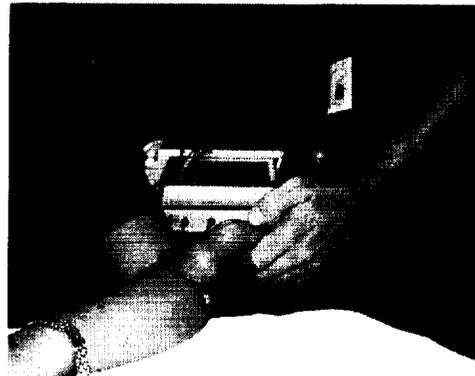
**Erik T. Nason, MS, ATC/L, EMT**  
The Bionetics Corporation, Kennedy Space Center

## **Abstract**

This study gathered data using the employees that were treated at the Kennedy Space Center (KSC) RehabWorks program between July 1, 1997 and June 30, 1998. The study showed the time lapses between 1) the patient's date of injury and the first doctor's visit, 2) first doctor's visit and first RehabWorks appointment, and 3) first RehabWorks visit and the discharge date. Also delineated were the most common body part injured, the most common injury type and the total number of visits. All results were differentiated between worker's compensation patients and non-worker's compensation patients. Analysis of the data reflected the effectiveness of the onsite musculoskeletal rehabilitation program known as RehabWorks

## **Introduction**

The RehabWorks program has been developed to provide all KSC employees with a free and convenient means of receiving rehabilitation services by Certified Athletic Trainers. The profession of Certified Athletic Training has grown in the world of Allied Health Professions and has recently been introduced to the corporate/industrial setting. A Certified Athletic Trainer can provide injury assessment and rehabilitation services to the "industrial athlete" in order to maximize long-term recovery and reduce lost work time.



## **Problem Statement**

Industrial injuries are occurring at KSC with employees traveling off-center in order to obtain rehabilitation services. The problems that occur with traveling off-center are:

- Lost time is incurred due to the patients having to travel to an outside rehabilitation center (approx. travel time >2hrs)
- Increased cost due to lost work time, physical therapy and sick time
- Lost productivity
- An increased probability for non-compliance due to distance and cost of outside rehabilitation

## Purpose Statement

The purpose of this study is to show the effectiveness of RehabWorks in providing on site rehabilitation to all KSC employees.

## Subjects

- Employees at KSC  
N=187 employees/patients
- All subjects were patients in the RehabWorks Program:  
First visit on or after July 1, 1997 and discharged by June 30,1998
- Subjects were referred by one of the following:  
Occupational Health Facility at KSC  
Outside physician  
Self referral

## Methods

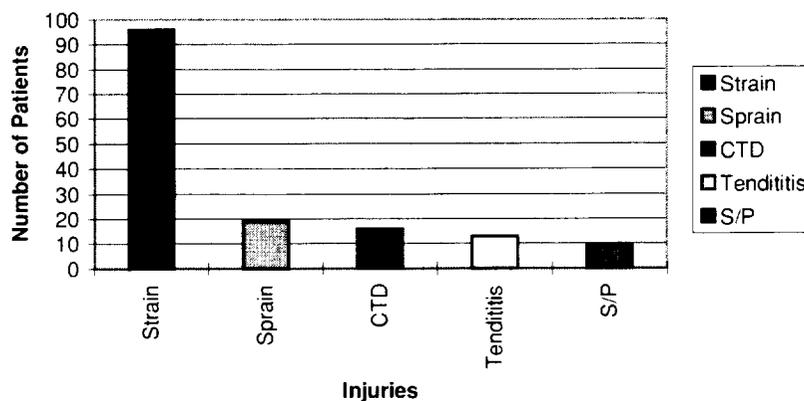
Monthly statistical reports were used to determine which patients were eligible to be subjects in this study. Data were then collected by retrieving information from patients' files. All data were analyzed in Microsoft Excel. When counting number of days, a seven-day week was utilized.

## Statistical Analysis

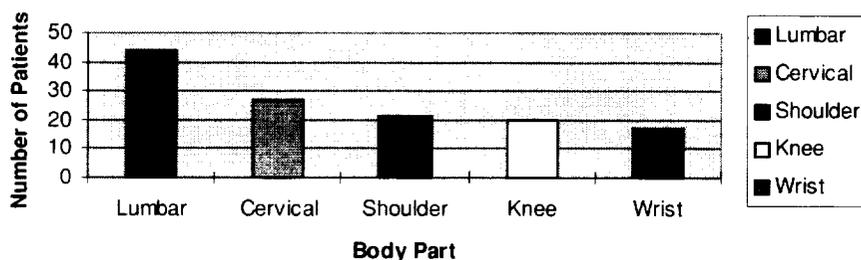
Descriptive data were developed from the following data fields:

- Number of days between date of injury and first doctors visit
- Number of days between first doctors visit and first appointment with RehabWorks
- Number of days between first appointment with RehabWorks and discharge date from RehabWorks
- Total number of visits with RehabWorks
- Differences between worker's compensation patients and non-worker's compensation patients

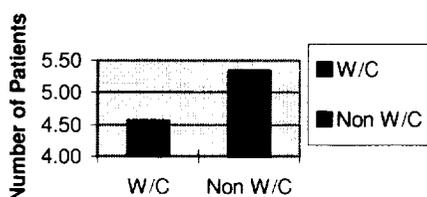
**Most Common Injury Type**



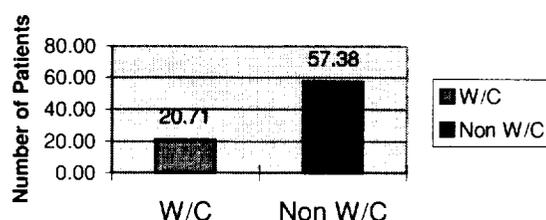
### Most Commonly Injured Body Part



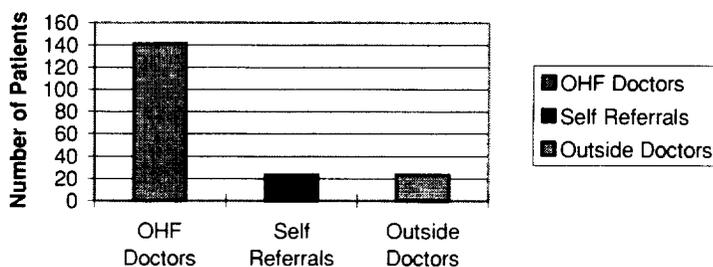
### Average Days From Rx Date to 1st Visit at RehabWorks



### Average Days from Date of Injury to 1st Doctor's Visit



### Referral Source



## Discussion

The average enrollment time was 16.45 days with a patient having an average of 4.54 visits; therefore, a patient would have a visit on the average of every 3.62 days. The average number of days between the date of injury and first doctor's visit was rather high, at 24.21 days, but once the patient was seen by a doctor it only took an average of 4.66 days to be seen by personnel at RehabWorks. As there are no previous data for comparison, there is no way of predicting a norm in a statistical analysis. This study shows that workers' compensation patients have a faster turn around time than non-worker's compensation patients.

## **Conclusion**

A focus needs to be made on decreasing the time between the first doctor's visit and the first RehabWorks appointment.

A decrease of time between date of injury and first doctor's visit needs to be accomplished by medical professionals educating KSC employees on the importance of obtaining care for acute injuries. RehabWorks can use this data to build and design a better operating program.

Future studies need to be completed to show any potential correlation with the total number of days enrolled with RehabWorks and the elapsed time between 1) the date of injury to first doctor's visit, and 2) the first doctor's visit to first RehabWorks appointment.

## **Health Physics Innovations Developed During Cassini for Future Space Applications**

**Rodney E. Nickell and Theresa M. Rutherford**

EG&G Florida, Inc.

**George M. Marmaro**

Kennedy Space Center

### **Abstract**

The long history of space flight includes missions that used Space Nuclear Auxiliary Power devices, starting with the Transit 4A Spacecraft (1961), continuing through the Apollo, Pioneer, Viking, Voyager, Galileo, Ulysses, Mars Pathfinder, and most recently, Cassini (1997). All Major Radiological Source (MRS) missions were processed at Kennedy Space Center/Cape Canaveral Air Station (KSC/CCAS) Launch Site in full compliance with program and regulatory requirements. The cumulative experience gained supporting these past missions has led to significant innovations which will be useful for benchmarking future MRS mission ground processing. Innovations developed during ground support for the Cassini mission include official declaration of sealed-source classifications, utilization of a mobile analytical laboratory, employment of a computerized dosimetry record management system, and cross-utilization of personnel from related disciplines.

### **Introduction**

The United States has an outstanding record of safety utilizing MRSs on 23 missions over the past three decades. Experience gained during these missions has provided useful benefits in Health Physics planning for future missions.

### **Background**

Radioisotope Thermoelectric Generators (RTGs) and Radioisotope Heater Units (RHUs) are lightweight, compact spacecraft power systems that are extremely reliable. RTGs/RHUs are not nuclear reactors and have no moving parts. They provide power through the natural decay of plutonium (mostly Pu-238, a non-weapons grade isotope). The heat generated by Pu-238 is converted into electricity by solid-state thermoelectronics located inside the RTG. Approximate activity of each RTG is 132,500 Curies and of each RHU, approximately 33 Curies. Neutron plus Gamma radiation levels were typically measured at ~1 Rem/hr on contact, 100 mRem/hr at 3-5 feet, and ~2 mRem/hr at 25 feet away from each RTG. The Neutron plus Gamma radiation levels around a single RHU was ~2 mRem/hr at six inches.

The Cassini program utilized four RTGs (three flight and one spare) as a power source for the deep space exploration mission. Approximately 124 RHUs were also utilized as part of the Cassini mission. Additionally, several of the scientific experiment packages flew custom fabricated minor radioactive sources for internal calibration. The cumulative experience gained supporting RTG missions has led to significant innovations that will be useful for benchmarking future MRS ground processing operations. These innovations are summarized below.

### **Sealed Source Classification**

The need to plan and support Cassini mission operations in accordance with the new government philosophy of “faster-better-cheaper” was repeatedly emphasized during many Titan/Centaur/Cassini ground operations working group meetings held at the Launch Site. This philosophy had to be imposed while being fully committed to the “Safety First” policy required of all aerospace activities.

The KSC and 45<sup>th</sup> SW Radiation Protection Officers, recognizing the impending limitations on current and expected support staff and resources, formally requested the Department of Energy (DOE) to investigate the potential for reclassifying the RTGs and RHUs as “Sealed Sources.” This request applied to ground handling and processing support for these units at the Launch Site.

The DOE Albuquerque Operations Office, together with staff from Los Alamos and Sandia Laboratories, studied a variety of regulations and standards on sealed sources, including ANSI N43.6-1977 (R1989), “Sealed Radioactive Sources-Classification.” DOE concluded that, in their flight configuration, the units met or exceeded all applicable terrestrial sealed source criteria and classified the units accordingly.

This classification relieved the Launch Site from complying with numerous DOE “non-reactor nuclear facility” requirements and local Radiation Protection Program requirements that were imposed for static RTG conditions during previous MRS programs. The most significant items of relief are listed below. It should be noted that some of these support functions were implemented during dynamic activities that involved personnel occupancy of the RTG/RHU areas.

#### **RTG Facility (RTGF)**

- Continuous facility internal negative pressure differential
- Emergency high efficiency particulate air filtered facility air exhaust
- Emergency exhaust duct alpha monitoring access
- Continuous storage/operations area alpha air monitoring
- Remote and local air monitor alarm systems
- Remote air monitor alarm reset system
- One-hour Health Physics response for after-hours air monitor alarm reset failure
- Instantaneous backup heating, ventilation and air conditioning
- Instantaneous backup power

## **Launch Complex-40 Launch Pad (SLC-40)**

Post installation alpha air monitoring

### **ALARA Optimization**

Restricting personnel radiation doses As Low As Reasonably Achievable (ALARA) was a major goal during Cassini RTG/RHU ground operations. Another major goal was to keep the RTG/RHU non-handler personnel exposure to less than 100 mRem Total Effective Dose Equivalent for the entire Cassini mission at KSC/CCAS. Effective implementation of ALARA concepts and minimization of individual and collective dose included the following:

A key element in the ALARA engineering concept was the DAMP process. This process was imposed on all organizations involved in the ground processing and launch preparation of RTGs. The primary goals of this process include:

- Characterization of potential radiation exposures to personnel during RTG operations
- Operations analysis of planned activities, projected man-loading, and timelines
- Limitations of operations based on analysis
- Ongoing evaluation of radiation dose data
- Final dose assignments

Direct support task organizations were repetitively polled for information relative to task streamlining, handling fixtures/tools, etc. to minimize personnel dose. This was accomplished by requiring each organization to identify and document (on Baseline Data Input forms), each operation and the number of personnel that would be within the RTG radiation restricted areas. The data provided were evaluated and assessed to project radiation dose and optimize operations planning.

The participation by Health Physics support personnel in RTG rehearsal operations (Trailblazers) was valuable in observing specific operational procedures that could be refined for ALARA purposes. Post-rehearsal evaluations were discussed and lessons learned from these operations were incorporated into final ground operations procedures.

Stressing the basic Health Physics fundamentals of time, distance and shielding during the various safety review meetings gave an increased awareness to all participants. This emphasis assisted the affected organizations in adequately planning for ways to reduce radiation exposure during RTG ground operations.

Regularly scheduled maintenance tasks to be performed in a radiation area were postponed or rescheduled to times of minimal RTG presence within the affected facilities.

Procedures governing operations involving RTGs were reviewed for dose reduction techniques to ensure that Health Physics support personnel made appropriate provisions for adequate surveillance.

RTG operations which may have been performed as a result of unplanned facility outage, systems or equipment failure, etc., were required to be supported/monitored by Health Physics personnel. As much as was feasible, given the nature of unplanned events, real-time assessments would be made and plans developed for performance of the event in accordance with ALARA principles and the guidelines described by the Radiation Protection Program requirements.

Health Physics personnel provided numerous RTG/RHU radiation training and orientation sessions to various groups and organizations involved in Cassini ground operations throughout the pre-launch campaign.

The use of remote closed circuit television (CCTV) minimized the need for operational personnel to routinely enter a radiation area to check and verify the status of various gauges, valves, or other ancillary maintenance equipment. In addition, security inspections could be conducted using CCTV instead of direct observation.

DOE provided specially built portable neutron shields that were utilized at processing facilities during RTG operations. These portable shields attenuated neutron radiation fields to personnel working in the close proximity of the RTGs and could be easily moved from one location to another depending on work in the area.

### **In-Situ Computerized Dosimetry and Training Database**

Health Physics personnel were required to have an accurate accounting of all individuals' radiation exposure and training during the Cassini mission. Health Physics personnel, along with the Environmental Health Computer Programmer, instituted a computerized personal dosimetry/training record database management system and in-situ laptop data workstations.

Through the use of an in-situ laptop workstation, Health Physics support personnel could enter dosimetry/training information at the various work locations (RTGF, Payload Hazardous Servicing Facility, SLC-40) during ground processing operations as well as the Environmental Health Facility (EHF). This procedure allowed for direct dosimetry issuance and verification of training prior to operational support at the work location. It also allowed for entry of pocket ion chamber (PIC) dose information, as necessary, for personnel upon completion of tasks as they left the work area.

It was essential that up-to-date information be available to Health Physics support personnel in the field. All information entered into the laptop would be downloaded daily into the Cassini Records Management database at the EHF. Laptop data would be downloaded into the main system, updated, re-indexed and then reloaded onto the portable unit. This was done to ensure that all dosimetry/training records would be current when the laptop was brought back to the work location the following day.

The dosimetry system was setup in such a way that reports could be generated in many ways. Upon request, Health Physics support personnel could generate reports by organization, time frame (daily, weekly, monthly, or duration of project) and use location. This was a valuable feature for RTG handler organizations. The availability of reports allowed managers and/or supervisors to review personnel exposures on a daily basis and assist in establishing support schedules to accommodate ALARA optimization.

In addition, the dosimetry data management reporting system was essential in preparing the final exposure report upon completion of the Cassini mission. The final report included the following:

- Total exposure by organization (NASA, USAF, DOE, or contractor)
- Breakdown by section, department or job classification within each organization
- User type (handler vs. non-handler)
- Total corrected exposure by individual for the duration of the mission

Another enhancement was that the dosimetry database system also accounted for neutron to gamma correction factors based on the type of dosimetry issued. Dosimetry utilized by RTG handler and Health Physics personnel was supplied by Bechtel-Nevada, under contract with the DOE. Doses were reported for mixed field neutron/gamma exposures. The R.S. Landauer Corporation supplied dosimetry for non-handlers. These TLDs were configured for gamma-only radiation exposure (neutron-insensitive) and were adjusted for the mixed field environment using a correction factor of 4 (i.e., consensus neutron to gamma ratio of 3 to 1). On occasion, PIC (gamma type) dosimeters were also issued to selected RTG handler and non-handler personnel during RTG ground operations to augment the dose assignment process. This automated correction factor feature aided in final dose assessment reports generated at the completion of the Cassini mission.

This records management enhancement was also utilized as a database system to verify that appropriate training was received prior to issuance of any type of dosimetry. Basically, the system would not let Health Physics personnel issue dosimetry unless the individual had been entered into the training section of the database and issued a Cassini training overlay badge. The type of overlay indicated the level of training that was received, which was dependent on the type of work to be performed and distance to/from the radiation source(s).

The three primary training levels involved in ground processing operations required three different types of access overlays to identify the level of training. Levels of training included "Cassini Health Physics," which was used to identify direct Health Physics support personnel; "Cassini RTG/RHU Handler", for direct on-hands RTG/RHU workers; and "Cassini RTG/RHU Non-Handler" which included all other ancillary support personnel, such as security, trades personnel, administrative, safety, etc.

## **Radiological Support Process Integration**

As a result of supporting an MRS program once every seven to ten years, Launch Site personnel need to learn about RTG/RHU controls and requirements, either for the first time, or as a refresher. It means early, comprehensive and thorough planning, obtaining maximum visibility of requirements within limits, maintaining contact with everyone that is affected, and verifying that the right balance and perspective are achieved. Perhaps the most challenging objective is the need to integrate and blend the different, and often competing or conflicting, requirements throughout the planning, the ground processing, and the launch itself.

Extensive utilization and adaptation of pre-existing, in-place processes was often employed, rather than creating new ones, to ensure that the radiological support requirements were acceptably integrated into the standard spacecraft processing/launch planning, development, and operations support. The KSC/RPO, 45<sup>th</sup> SW/RPO, and the Health Physics Office participated in the Expendable Vehicle Payloads Safety Review Process, which followed the Shuttle Payload framework of periodic Phased Safety Review sessions. In these reviews, which began several years prior to scheduled lift-off, RTG/RHU-related hazards, controls, and requirements were thoroughly addressed and incorporated into the standard safety assurance process. This procedure ensured that the entire Safety Community was fully aware of the unique radiological requirements and what was necessary for compliance and documentation.

Ground operations review processes, which were adapted and utilized for radiological health support purposes, included the KSC Cassini/RTG Payload Ground Operations Working Group and the Titan/Centaur/Space Vehicle Ground Operations Panel. A special Radiological Sub-Working Group was established within the frameworks of these two key review processes. This group was instrumental in coordinating activities and implementing the two-way flow of radiological information to ensure compliance with all RTG/RHU-related radiation protection requirements. Other processes included the KSC/CCAS Security programs, facility access control systems, the KSC Systems Training process, KSC and CCAS Support Scheduling, and a variety of pre-test and operations support briefings.

In addition to these external processes, several new interrelated systems within the Radiation Protection Program were developed and instituted. They included dosimetry issuance, dosimetry records, training, radiation area access authority, and ALARA optimization (DAMP). In addition, the Ionizing Radiation Protection Program document, KHB 1860.1, was revised to compile these aspects into a single integrated radiological control and support document.

## **Cross Utilization of Qualified Personnel**

From its earliest stage, it was recognized that additional support personnel would be necessary to accomplish all the Health Physics operational requirements involved in operations for the Cassini mission. Requests for additional support personnel were submitted to multiple agencies involved in the Cassini mission. NASA, USAF, DOE, and various contractor organizations responded by committing approximately 20 individuals to support the Cassini mission ground operations and launch phase preparations.

A comprehensive review of each participant's education, experience and qualifications was performed to determine the best placement of personnel identified for support. Most individuals had some type of formal Health Physics training, while others had direct Health Physics experience. Other participants had comparable science education backgrounds in environmental health, industrial hygiene, biology, chemistry or safety, but lacked direct Health Physics monitoring experience.

Additional site related and mission-specific technical training regarding Cassini mission support requirements was provided to all support personnel. This training included orientation videos, briefings and direct on-the-job training. Local Health Physics representatives provided hands-on training.

Supplemental support personnel were paired with fully qualified Health Physicists for each operational task assigned, based on previous training and education. In addition, personnel involved in the cross-utilization process were assigned to tasks related to their areas of expertise, if possible, to fully augment support teams.

Health Physics support was often required during concurrent operations, such as RTGF activities and RTG operations at SLC-40. Cross utilization of personnel proved to be of great value in meeting all the radiological requirements in the Radiation Protection Program during ground processing of the RTGs/RHUs for the Cassini mission.

## **In-Place Analytical Counting Laboratory**

Health Physics support personnel perform radiological surveys during all phases of RTG operations. Because of this requirement, Health Physics support personnel employed the use of an in-place, secondary analytical counting laboratory located inside the RTGF. This enhancement contributed to the overall efficiency of ground processing activities in the following ways.

During initial transportation and off-loading, surveys were performed to document radiation areas and to ensure transport vehicle and shipping container were free from external contamination. In addition, contamination surveys were required on a daily basis to identify/verify potential contamination prior to RTG handler operations. Due to operational timelines, results of this analysis needed to be available within minutes. Distance between the primary counting lab, located within the EHF, and RTGF is approximately 5 miles and average travel time is 5-10 minutes by vehicle. To accommodate these requirements, Health Physics personnel established a basic (secondary) counting lab located within the RTGF. With in-place laboratory counting capabilities, travel and response time needed for analyzing samples and obtaining results were greatly reduced.

With an in-place analytical counting laboratory capability, this enhancement became not only a time saver but also a cost saving benefit. When sample analysis was performed at the RTGF, a reduced number of Health Physics support personnel were needed to support operational requirements. Basically, a single Health Physics Specialist could perform daily contamination surveys, analyze, and document results without needing additional personnel to transport samples back to the primary counting laboratory for analysis and await results.

Another benefit was a reduction in the number of operational personnel required to be within the radiological controlled areas at any one time. This, in turn, reduced occupancy factors within the RTF and contributed to the ALARA concept.

## **Summary**

Future ground processing of MRS missions at the KSC/CCAS Launch Site will continue into the new millennium. The cumulative experience gained supporting these MRS missions has led to significant innovations which will be useful for benchmarking future ground processing. Innovations employed during the Cassini mission ground support included official declaration of "sealed-source" classification, utilization of a secondary in-place analytical laboratory, employment of a in-situ computerized dosimetry and training database management system, cross-utilization of personnel from related disciplines, ALARA optimization techniques and radiological support process integration. By combining these innovations with benchmarking experience from other areas, Health Physics support personnel were able to ensure safe and effective systems processing that accommodates both ALARA optimization and mission success.

# **Rebuilding the JSC Employee Assistance Program**

**Jacqueline E. Reese, MA, LPC**

Kelsey Seybold  
Johnson Space Center

## **Abstract**

Three primary tasks were essential in rebuilding the Johnson Space Center (JSC) Employee Assistance Program (EAP). The program was staffed with licensed, clinically trained psychotherapists and experienced support personnel. The program was designed to comply with national EAPA standards and the standard of care of the American Counseling Association (ACA). In December 1997, the JSC EAP obtained ISO 9000 certification. Current services of assessment, brief therapy, referral, and seminar presentations were expanded to include on-site emergency interventions and debriefing, assistance to the ERT. They also include coordination with the EOC, participation in a formal disaster plan, case management, coordination of services with Human Resources (HR) and Equal Employment Opportunity (EEO), and expanded specialized resource referrals. Staff visibility was increased through brief introductory outreaches. Posters, brochures, newspaper articles and a web-site, and a booth at Safety and Total Health Day were utilized. Program utilization has tripled in the past year.

## **Process**

### **Provide a Standard of Quality**

- EAPA Standards
- ACA Standards
- ISO 9000 Elements

### **Provide Broad Range of Services**

Focus services on prevention and early detection as well as intervention.

- Assessment
  - Brief therapy
  - Referral
- Coordination of benefits
- Case management
- Workshops
  - All areas of mental health
- Crisis Intervention
  - Emergency Response Team
  - Emergency Operations Center
- Coordination with HR and EEO
- Specialized referral resources

**Maximize Awareness**

- Increase visibility through brief introductory outreaches.
- Interface with HR, security, supervisors, and clinic staff.
- Visual
- Posters
- Brochures
- Newspaper articles
- Web-site information
- Safety & Total Health Day booth

**Conclusions**

The introductory outreaches appeared to be the most affective tool in increasing awareness and re-establishing credibility. Many clients reported that seeing clinicians in person helped them feel more comfortable with calling to make an appointment.

Clients also cited the Safety and Total Health Day booth, brochures, and posters placed in all buildings as helpful sources of information about the program.

As supervisors, human resources representatives, and medical staff learned of staff qualifications and program adherence to professional standards, they reported renewed confidence in referring employees to the program.

Emergency and security personnel now have an understanding of the assistance EAP counselors can provide during crisis situations, and long term benefits of immediate intervention in restoring productivity in traumatized employees.

## **Johnson Space Center Safety and Total Health Day**

**Janelle Reinoso and Sheilla Goldberg, MS**

Kelsey-Seybold

Johnson Space Center

Safety and good health are a person's most vital assets in living a full and productive life. Recognizing this, JSC has set aside one day each year devoted entirely to safety and health education.

The Safety and Total Health (S&TH) Day Steering Committee primarily coordinates this day. Membership is made up of chairs of the following subcommittees, and usually begins to meet about six months before S&TH Day.

- The Logistics Subcommittee coordinates booth and seminar locations and prepares a map of activities that is distributed to employees.
- The Booth Recruitment Subcommittee obtains booth participants from on-site and off-site contractors, community services, and private companies. They are responsible for communication with these groups concerning S&TH Day logistics and rules.
- The Advertising Subcommittee communicates the events of S&TH Day to all on-site and off-site civil service and contractor employees by distributing catalogues and maps of all booths and seminars prior to the event. This advance notice allows employees and managers the opportunity to schedule their day to derive the maximum benefit from the day's activities.
- The Managers' Support Subcommittee handles the coordination of the T-2 month Managers Meeting. This informational meeting, held two months before S&TH Day, communicates to civil service and contractor managers the resources available for planning in-house S&TH Day activities. Central to S&HT Day is the program designed by individual management teams specifically for their employees' needs and interests.

Booths, located around the central JSC mall, are open on S&TH Day from 10:00 to 15:00. In addition to booths and seminar speakers, several special events are held in conjunction to S&TH Day. They include: the Children's Safety and Health Calendar Contest; Fun Run/Walk; a Blood Drive; mass Cardiopulmonary Resuscitation (CPR) training sessions in the morning and afternoon; safety and health videos broadcast over the on-site television channel throughout the day; and an outdoor lunch concert by a JSC-based band.

Johnson Space Center has found that having an annual day dedicated to health and safety awareness has many advantages:

- We can save lives; we can change lives
- People are the ultimate source of safety and health. S&TH Day is an opportunity for the JSC community to increase their awareness of safety and total health. A healthy work force is our strongest asset.
- Employee and line management involvement in safety and health will increase.

To plan a successful S&TH Day, start early and involve as many people as practical. “Your employees will get as much out of this day as you put into preparing for it.” –Larry Neu, Safety & Total Health Day Coordinator

# **Evaluation of Cardiovascular Screening Retest for High Risk Employees - Update**

**Carol A. Roth, RN, MSN**  
EG&G Florida, Inc.  
Kennedy Space Center

## **Introduction**

The Kennedy Space Center (KSC) Health Education and Wellness Program, initiated in 1984, is open to all employees at KSC and Cape Canaveral Air Station (CCAS) at no charge. The goals of the program are to make employees more aware of their health and to screen for early detection of health problems. These are achieved through training classes, worksite lectures, health screenings, informational health packets, individual counseling, pamphlets and videotapes. Prevention is the focus of the program. It is based on four principles:

1. Educate employees about their bodies and healthy lifestyles.
2. Help employees identify present problems and risks factors for potential problems.
3. Assist employees in the reduction or elimination of risk factors.
4. Support employees in maintaining their healthy lifestyle through monitoring and evaluation.

Every month a different health program is featured on a wide variety of topics.

## **Background**

The most popular and important program is the annual cardiovascular disease (CVD) screening, held each February, which evaluates the employees' cardiac risk factors. The CVD screening includes completion of a comprehensive questionnaire (demographic data, a current health history, family history, smoking and exercise history), a blood pressure measurement and blood analysis of cholesterol, triglycerides, HDL and glucose.

After all the data is collected, tables modified from the Framingham Study are used to calculate the cholesterol/HDL ratio, LDL and risk factor (RF) on the computer. The results are then sent to the employee along with a report listing the average population ranges for each factor tested and an explanation of relative risk. The report also includes the elevated RF the employee must modify to reduce his risk, the RF and cholesterol/HDL ratio from all previous years the participant was screened (for comparison). A packet of health information on heart disease, its prevention, diet, exercise and smoking are also sent to the employee. Health counseling is available to everyone who participates. A special letter is sent to each high risk participant suggesting actions to be taken to reduce risk and offering individual counseling at any time.

## Methods/Process

The CVD screening is open to all employees on a voluntary basis. Most lab values are within normal limits. The abnormal values have been about 14% of the participants each year. It is this group, the high risk employees, that have been targeted for further testing.

In 1993, an intervention program was designed to retest, re-evaluate and counsel high risk participants identified in February. The retest is scheduled in September to determine RF change. One criteria used for retest eligibility is a RF above 4. Criteria used for calculating RF are age, sex, smoking status, systolic blood pressure and total cholesterol. A cholesterol/HDL ratio above 7.5, or a very positive family history for risk, are other criteria. Letters are sent to notify the selected employees. Approximately 500 employees are offered retest, with a final participation rate of 50%. The same procedures are followed as in the February screening. A repeat questionnaire is completed asking for any changes in lifestyle or medications in the last six months.

Criteria established for a significant change are listed.

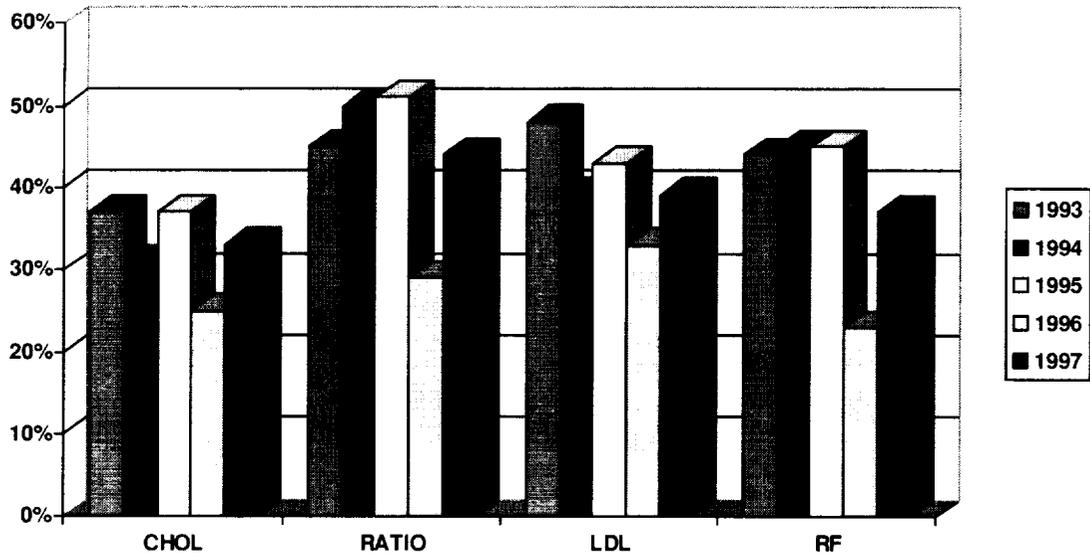
### Tolerance

Cholesterol	+/- 10%
HDL	+/- 10%
Cholesterol/HDL Ratio	+/- 0.5%
LDL	+/- 10%
Risk Factor	+/- 0.5%

The re-test results letter sent to each participant contains the results from the February and September screens. Employees can then compare the values to see what changes occurred.

## Data/Results

The data in the following graph represents the percentage of high risk employees who had reduced their cholesterol, chol/HDL ratio, LDL, and risk factor by the pre-set criteria during the six- month period.



The following chart shows significant improvements (reduced risks) in values of the high risk employees in the six-month period.

**Percentage of Employees Who Reduced Risk**

	1993	1994	1995	1996	1997
Reduced Cholesterol	37%	31%	37%	25%	33%
Reduced Cholesterol/HDL Ratio	45%	50%	51%	29%	44%
Reduced LDL	48%	39%	43%	33%	39%
Reduced Risk Factor	44%	45%	45%	23%	37%

**Conclusions/Recommendations**

The data is fairly consistent from 1993 through 1995. There was a significant drop in the percentage of employees who decreased lipid values and risk factor (RF) in 1996. One conclusion drawn for this decrease was KSC and CCAS employees' expressed concerns about employment status and job security. Contract changes, budget cuts and contemplated layoffs were being considered in 1996. This uncertainty and subsequent stress may have had a negative effect of the employees' motivation to improve lifestyle behaviors.

The data from September 1997 was improved from 1996, but was not as positive as the years 1993 through 1995. The threats of uncertain employment status were still there, but not as severe as the previous year. The 1997 improved reductions in lipid values and risk factors may have reflected the more positive attitudes toward job security last year.

Stress can affect the heart, circulatory system and lipid values. Studies have suggested that there is a relationship between stress and increased lipid values. The body's 'fight or flight' mechanism causes the release of hormones, with metabolic consequences. This mechanism is for short-term emergencies. Prolonged, repeated and persistent stress can lead to adverse effects in metabolism, causing blood lipids to rise and body fat to be adversely distributed. To relieve the tension and anxiety of stress, people make poor food choices, increase smoking and alcohol consumption and decrease exercise. These behaviors have an adverse effect on health and increase risk factors.

This year's repeat CVD screening will be held in September 1998. Since 1998 has also been a stressful year, because of upcoming contract changes and threatened layoffs, it is speculated that the results will be similar to 1997.

# **The Need to Reevaluate Nonresponding Ergonomic Patients**

**Philip J. Scarpa, MD, MS and Steven A. Field, MD, MSPH**

Biomedical Office  
Kennedy Space Center

## **Introduction**

The Kennedy Space Center (KSC) Environmental Health (EH) contractor performs ergonomic evaluations under its Ergonomic Program. Any KSC employee may request one or the reviewing physician may request one for a patient during a visit to an onsite medical facility. As part of the ergonomic evaluation, recommendations are given to the patient to help reduce any ergonomic problems they experience. The recommendations, if implemented, are successful in the majority of KSC patients; however, a group of patients do not seem to improve. Those who don't improve may be identified by reevaluations, which are performed to implement maximum resolution of ergonomic problems.

## **Background**

Ergonomic injuries now occur with greater frequency than ever before with the increasing prevalence of computer workstations, mechanical tools, and repetitive tasks which employees perform. Patients who report to one of the KSC onsite medical clinics and are found to have a possible ergonomically-induced condition are treated and referred for a KSC EH evaluation. EH personnel utilize the latest Occupational Safety and Health Administration (OSHA) methods to conduct an ergonomic evaluation of the employee and the employee's work area. Recommendations are then given which could include changes in body position, equipment, and equipment usage, rehabilitation, and preventive exercises. Initially, ergonomic evaluations were performed without any follow-up assessments. Recently, however, one ergonomic follow-up study conducted at KSC (ref. 1) revealed that there are still a group of patients who do not improve despite implementing the recommendations. These patients could possibly return to the clinics repeatedly or could remain in pain and therefore be unproductive. This study investigated the reasons why these patients did not respond to the OSHA-based proposed ergonomic recommendations. In addition, the study assessed the utility of repeated follow-up ergonomic evaluations.

## **Methods**

The Geyer study (ref. 1) which performed a follow-up assessment of patients initially evaluated for ergonomic problems at KSC, was conducted a few months prior to this study. Results from the Geyer study showed that 13 of 59 patients (22.0 %) continued to have some ergonomic symptoms despite implementing half or all of their recommendations.

Based on these results, this group of partial responders or nonresponders was reevaluated by reassessing their initial ergonomic evaluation reports and medical records. They were later telephoned or visited onsite at their workstations or work areas. Evaluation included

rescoring the OSHA- based contractor questionnaires used during the patient's initial ergonomic evaluation. Patients were asked how they used recommendations they were given and their use of equipment and work techniques was observed. Some patients were also medically reassessed.

## Results

After reevaluating the 13 partial responders or nonresponders identified in the Geyer study, three patients were found to have spontaneously improved and had no symptoms. The ten remaining patients improved only 50%, on average, from their initial ergonomically related conditions. This group of partial responders or nonresponders had various reasons for their continuing symptoms. (See fig. 1) Some of the reasons were that the equipment needed was not available, the equipment acquired was not used properly, rehabilitation was not performed or medications were not utilized if prescribed or were not prescribed at all. Other reasons were that not all recommendations were implemented or they were implemented properly, increased job stress, initial condition was misdiagnosed, or there simply was not enough time for the ergonomic condition to physically recover (mostly <2 weeks from initial diagnosis). Most of these reasons could be easily resolved during these follow-up assessments.

## Conclusions

For the majority of patients, the KSC Ergonomic Program makes recommendations during an ergonomic evaluation that are effective in improving and further preventing ergonomically related symptoms. However, a significant group of patients are continually symptomatic despite implementing some or all of their recommendations. Those patients showing partial or no response can be identified during a follow-up assessment. A most efficient follow-up time period was determined to be approximately 90 days after an initial ergonomic evaluation. These patients have many reasons for not recovering that would easily be removed in follow-up counseling and reassessments. Further targeted follow-ups could occur as needed for this purpose.

## Recommendations

We recommend that occupational medicine programs, which evaluate ergonomic patients, formally plan follow-up reevaluations at least 90 days after initial evaluation and target the patients who have partial or no response for repeated follow-up ergonomic counseling and reassessments.

1. Geyer, Bart. "A Follow-up Study of Ergonomic Evaluations Performed at KSC/CCAS in 1997", Poster for the 1998 NASA Occupational Health Conference.

**Fig. 1: Reasons for Partial or Nonresponders**

Improper implementation of recommendations,	9/13 (69%)
Not all recommendations were implemented,	7/13 (54%)
Not enough time was allowed for full recovery,	3/13 (23%)
Implemented all recommendations but not for enough time,	1/13 (7.7%)
Too much or changing job stress,	1/13 (7.7%)

# **Profile of Ambulance Runs at the Kennedy Space Center**

**Philip J. Scarpa, MD, MS**  
Biomedical Office  
Kennedy Space Center

## **Introduction/Background**

The Kennedy Space Center (KSC) has four onsite ambulances staffed with Paramedics at two fire stations that respond to 911 Emergency Medical System (EMS) medical dispatches. These ambulances serve over 22,000 NASA, military, government, and contractor employees in an area of approximately 520 square miles. Included in this coverage are several public areas such as beaches, a wildlife refuge and a popular Visitor Center. Reports are filled out on each patient encountered. However, the only element tracked has been the ambulance response time. Now that reports are filed electronically, it is possible to enter them into an electronic database for analysis. Data analyses reveal trends and assist in better allocation of resources.

## **Methods**

From May 1997 to June 1998, all KSC Ambulance run reports were filed electronically. This information was then loaded into an Access database and queries were made of the data. Every patient encountered received an ambulance report. Information gathered and loaded included: Date, Day, Incident number, Ambulance number, Paramedic's names, time out, patient contact, time left scene, patient's name and demographics, chief complaint/diagnosis and follow-up information. A Microsoft Access for Windows 95 generated results based on queries from this database.

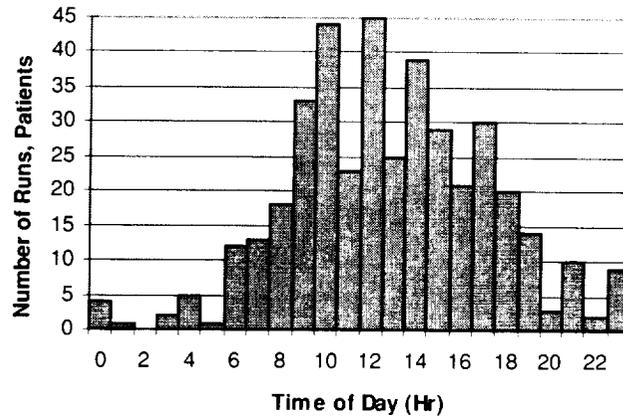
## **Results**

A total of 403 ambulance run reports was gathered during this one-year time frame. The most common age range was 41-50 (see table 1) and the most common type of person was white males. Wednesdays between 12:00-12:59 during May were the most common times (see figs. 1,2,3). The average ambulance response time to patient contact was 3.71 minutes. Approximately half of all patients seen in ambulance runs were tourists and not employed by KSC. However, employees of the largest onsite organizations, such as USA, EG&G, Boeing, and NASA, contributed the largest number of non-tourist patients. Of greatest interest and use from this study were the chief complaint/diagnosis, the location, and any follow-ups that occurred. Chest pain, minor injuries, car accidents, and unknown case causes were the most common (see fig. 4). Highways/roads, at the KSC Visitor Center, or at one of the three onsite medical clinics were the three most popular locations. Fifty-six percent of all patients were transported to an area hospital and/or to an onsite medical clinic.

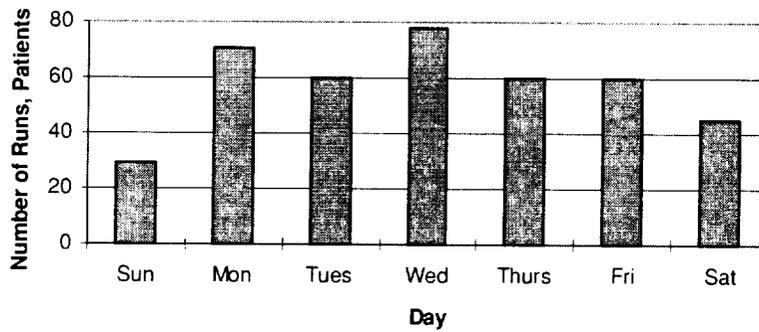
**Table 1**  
**Age Distribution Summary**

Age 0 - 10 = 43  
 Age 11 - 20 = 27  
 Age 21 - 30 = 36  
 Age 31 - 40 = 66  
 Age 41 - 50 = 87  
 Age 51 - 60 = 86  
 Age 61 - 70 = 34  
 Age >70 = 17

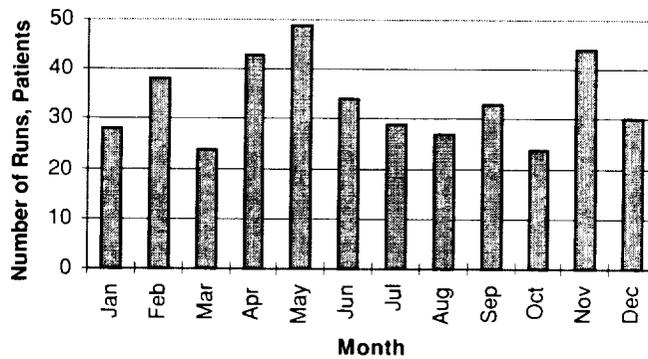
**Figure 1**  
**Number of Runs, Patients vs. Time of Day**



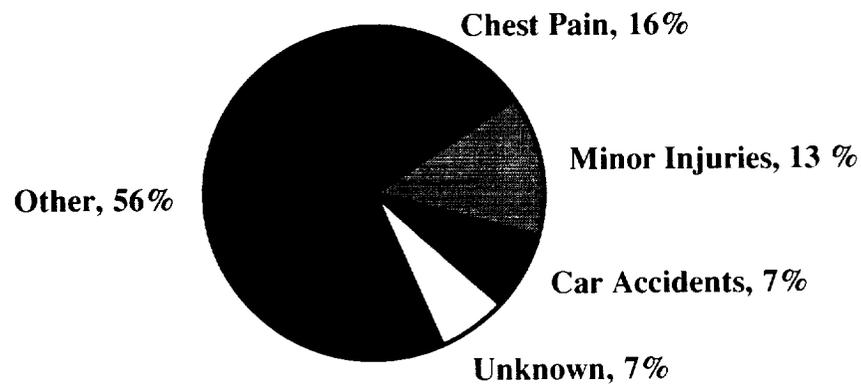
**Figure 2**  
**Number of Runs, Patients vs. Day**



**Figure 3**  
**Number of Runs, Patients vs. Month**



**Figure 4**  
**Percentage of Runs, Patients by Chief Complaint of Diagnosis**



### **Conclusions**

KSC ambulance run reports that were taken for one year were loaded into an electronic database. This information successfully profiled the patients and scenarios involved in the KSC ambulance response program. Specifically, the importance of the Visitor Center tourists, car accidents and highway safety, and prevention of coronary heart disease (chest pain) were revealed.

### **Recommendations**

Electronic databases are useful tools in helping to provide insight in managing medical programs. By analyzing ambulance runs and other medical information in databases such as these, managers may be better able to see patterns, recognize trends and better allocate limited resources.

Special thanks to Venu Oddiraju of Dynamac, Inc. and Supriya Kumar, MD for their contributions to this study.

## **Identification and Prioritization of Work Place Processes with Physical and Chemical Hazards at Kennedy Space Center and Cape Canaveral Air Station**

**John D. Sherwood**

EG&G Florida, Inc., Kennedy Space Center

The Industrial Hygiene (IH) Office initiated new procedures in fiscal year 1998 to identify and categorize work places at Kennedy Space Center (KSC) and Cape Canaveral Air Station (CCAS) which have processes where personnel may have a potential for exposure to physical and/or chemical hazards. The main drivers behind these procedures were to allow for more efficient utilization of manpower and to offer better service to our customers.

The process utilized to identify areas with potential for physical or chemical was the annual facility walk through inspection. OSHA standard 29 CFR 1960 requires that all Federal facilities be inspected annually to determine the potential for physical or chemical hazards to employees. To assure that the inspections were performed in a standardized manner, the currently used walk through form was modified to more readily meet our needs. A process was also developed in which a prioritization sheet could be used to identify locations with potential physical or chemical hazards and place a numerical value to these areas for follow-up evaluation based on the identified potential hazard(s).

Six-hundred-thirty facilities located on KSC and CCAS were inspected, resulting in the identification of a total of 372 work place processes in 196 facilities which have the potential for exposing personnel to physical or chemical hazards. The breakdown of areas identified is shown below.

Processes with potential hazardous chemical exposure	310
Processes with potential hazardous noise exposure	250
Processes with potential heat stress exposure	100

Once shops/processes were identified and potential hazards assigned a numerical value, based on the potential of personnel exposure to the hazard, they were "racked and stacked" by the assigned numerical value of the hazards. An example of the value of a numerical priority system is the chemical hazards area. For the above noted 310 processes identified as having a potential for personnel exposure to hazardous chemicals, the numerical priority ranged from a high of 150 points to a relatively low numerical value of 20 points. Using this system allows the IH Office to commit resources to areas where potential hazards are the highest.

Once properly identified and prioritized the areas with the highest potential for harm to personnel will be evaluated first. Baseline evaluations of these areas are currently being performed. Following the baseline evaluation, a schedule for follow-up is determined based on the actual exposure levels observed during the evaluation. The schedule may be determined by regulatory requirement, as is the case with lead. The OSHA standards for lead require a specific evaluation schedule based on previous personal air sampling results. Other chemicals not specifically regulated will be scheduled for follow-up evaluation based on factors such as toxicity of the product and multiple routes of exposure such as isocyanates that may be breathed or absorbed through the skin. Follow-up evaluations for other chemicals will also include frequency, duration and amount used and/or whether engineering controls are in place to reduce potential exposure to the hazard. Ultimately, the procedure being used will result in a safer work environment to personnel and “more bang for the buck” to the customer.

**EG&G ENVIRONMENTAL HEALTH  
INDUSTRIAL WORKPLACE HEALTH RISK ASSESSMENT**

**PRIORITY SHEET**

Bldg: Facility #14 \_\_\_\_\_ Workplace: \_\_\_\_\_ Paint Building \_\_\_\_\_

Supervisor: J. Little \_\_\_\_\_ Mail Code: \_\_\_\_\_ USF \_\_\_\_\_

Telephone: 867-9965 \_\_\_\_\_ Company/Org: \_\_\_\_\_ Org #9 \_\_\_\_\_

POC: J. Little \_\_\_\_\_ Process: \_\_\_\_\_ Painting Operations \_\_\_\_\_  
(If different than Supervisor)

Chemical Name: Hexamethylene diisocyanate, solvents, and Chromium

- Toxicity: \_\_\_\_\_ (40) pts  
High (carc, terat, muta, <1ppm, etc.) \_\_\_\_\_  
Score-frequency/duration & quantity  
High 40 pts, Moderate 30 pts, Low 10 pts

Moderate (>1ppm - 100 ppm) \_\_\_\_\_ ( ) pts  
Score-frequency/duration & quantity  
High 30 pts, Moderate 20 pts, Low 5 pts

Low (>101 ppm, etc.) \_\_\_\_\_ 5 pts

Multi-Routes of exposure? (Yes) \_\_\_\_\_ (40) pts  
Score-frequency/duration & quantity  
High 40 pts, Moderate 30 pts, Low 10 pts

Chemical application airborne potential \_\_\_\_\_ (20) pts  
High 20 pts; Low 5pts

- Number of personnel potentially exposed:  
1-5 \_\_\_\_\_ 5 pts  
6-10 \_\_\_\_\_ 10 pts  
Greater than 11 \_\_\_\_\_ (15) pts

-Process History  
New process - never evaluated \_\_\_\_\_ 20 pts  
Not evaluated within last 2 years \_\_\_\_\_ 10 pts  
Evaluated within last 2 years \_\_\_\_\_ (5)pts

-Respiratory Protection  
Respirators required? (Yes and worn) \_\_\_\_\_ 5 pts  
Respirators required? (Yes and NOT worn) \_\_\_\_\_ 15 pts  
Respiratory protection discrepancies? (Yes) \_\_\_\_\_ (10) pts  
RP program in place (No) \_\_\_\_\_ 10 pts

-Ventilation systems  
Ventilation in place & certified \_\_\_\_\_ 5 pts  
Ventilation in place but uncertified \_\_\_\_\_ (15)pts  
Ventilation exhaust system needed \_\_\_\_\_ 20pts

Sub Total \_\_\_\_\_ 145 pts

## KSC/CCAS ENVIRONMENTAL HEALTH PROTECTION PROGRAM WORK PLACE WALK-THROUGH SURVEY

### ADMINISTRATIVE DATA

<input type="checkbox"/> NASA <input type="checkbox"/> AIR FORCE	FACILITY NUMBER Facility 14	FACILITY NAME Paint Building	SURVEY DATE June 14, 1998
WORK PLACE/SHOP Paint Booths		ROOM/AREA Same	
OPERATIONS PERFORMED Spray and Brush application of polyurethane, epoxy, and corrosion control coatings			
COMPANY USF		SUPERVISOR J. Little	MAIL CODE USF
WORKPLACE TYPE Industrial		<input type="checkbox"/> NON-INDUSTRIAL <input type="checkbox"/> INDUSTRIAL <input type="checkbox"/> LABORATORY	IF INDUSTRIAL NUMBER OF EMPLOYEES 16

### POTENTIAL HAZARDS

HAZARD CATEGORY	ADEQUATE	DEFICIENT	FOLLOW-UP REQUIRED	NOT APPLICABLE
NOISE	<input type="checkbox"/>	<input type="checkbox"/>	X	<input type="checkbox"/>
ERGONOMICS	X	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
HEAT/COLD STRESS	<input type="checkbox"/>	<input type="checkbox"/>	X	<input type="checkbox"/>
CHEMICAL HAZARDS	<input type="checkbox"/>	<input type="checkbox"/>	X	<input type="checkbox"/>
VENTILATION	X	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
AIRBORNE PARTICULATES	<input type="checkbox"/>	<input type="checkbox"/>	X	<input type="checkbox"/>
CONFINED SPACES	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	X
ILLUMINATION	X	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
HAZARDOUS MATERIAL STORAGE	X	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PRESSURIZED CONTAINERS	X	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
OXYGEN DEFICIENCY	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	X
HAZARD COMMUNICATION	X	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PERSONAL PROTECTIVE EQUIPMENT	X	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
RESPIRATORY PROTECTION	<input type="checkbox"/>	<input type="checkbox"/>	X	<input type="checkbox"/>
BIOLOGICALS	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	X
INDOOR AIR QUALITY	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	X
RADIATION (IONIZING/NON-IONIZING)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	X
ASBESTOS	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	X

### REMARKS/EXPLANATIONS OF DEFICIENT OR FOLLOW-UP ITEMS

The spray painting in the subject facility will be evaluated to determine actual exposures to hazardous chemicals utilized.

The operations performed will be evaluated to determine if they should be determined to be a hazardous noise area.

Personnel performing these operations will be evaluated to determine their potential for heat stress.

SURVEY PERFORMED IN ACCORDANCE WITH 29 CFR 1960.26 BY M. Rodriguez	MAIL CODE B-22	PHONE 867-2400	DATE June 14, 1998
FACILITY MANAGER/WORKPLACE SUPERVISOR (WITH THIS SIGNATURE I CERTIFY THAT I HAVE RECEIVED A COPY OF THIS SURVEY FORM AND THAT ALL DEFICIENCIES AND REQUIRED CORRECTIVE ACTIONS HAVE BEEN EXPLAINED TO ME)			
DISTRIBUTION:    WHITE - AIR FORCE/NASA CONTRACT MONITOR YELLOW - ENVIRONMENTAL HEALTH OFFICE		BLUE - COMPANY SAFETY PINK - WORK PLACE SUPERVISOR	

# **Kennedy Space Center Coronary Heart Disease Risk Screening Program**

**David A. Tipton, MD, MS and Philip J. Scarpa, MD, MS**  
Biomedical Office  
Kennedy Space Center

## **Introduction**

Coronary heart disease (CHD) is the number one cause of death in the U.S. It is a likely cause of death and disability in the lives of employees at Kennedy Space Center (KSC) as well. The KSC Biomedical Office used a multifactorial formula developed by the Framingham Heart Study to calculate CHD risk probabilities for individuals in a segment of the KSC population who require medical evaluation for job certification. Those individuals assessed to have a high risk probability will be targeted for intervention.

## **Background**

Every year, several thousand KSC employees require medical evaluations for job related certifications. Most medical information for these evaluations is gathered onsite at one of the KSC or Cape Canaveral Air Station medical clinics.

The multifactorial mathematical formula has been published (ref. 1) based on information from the Framingham Heart Study. This formula allows calculation of a person's 10-year probability of acquiring CHD. The formula contains the following variables: Age, Diabetes, Smoking, Left Ventricular Hypertrophy, Blood Pressure (Systolic or Diastolic), Cholesterol, and HDL cholesterol. The formula is also gender specific.

This formula was used to calculate the 10-year probabilities of CHD in KSC employees who required medical evaluations for job certifications during a one-year time frame. This population was profiled and CHD risk reduction interventions could be targeted to those at high risk. Also, population risk could be periodically reevaluated for determining the effectiveness of intervention.

## **Methods**

KSC employees requiring medical evaluation for job certifications visited one of two onsite medical clinics. During the visit, medical information was gathered, assessed, and recorded. This same medical information was loaded into the Framingham formula and a 10-year CHD risk probability was calculated. The results from this population were graphed by gender. Ideal CHD risk values were loaded into the formula to generate an ideal risk 10-year probability of CHD. Others were compared to this ideal and risk ratios were generated. By definition, those under 1.0 have a better than ideal CHD risk factor and those over 1.0 have a worse than ideal risk.

## **Results**

From July 1, 1997 to June 30, 1998, a total of 3,994 KSC employees (3,608 male, 386 female) underwent medical evaluation for job certification. CHD risk factors were calculated for all these employees using the Framingham formula. The median age was determined and each gender's population was profiled based on the calculated 10-year probability risk factor ratio of CHD compared to an ideal individual of the population's median age (46 for males, 43 for females), (see Figures 1 and 2). The ideal 10-year CHD risk value for the subject male population was calculated to be 8.78%. The value was 9.12% for the subject female population. A skewed-to-the-right curve emerged for each gender. Those in the skew, or tail, were considered at significantly higher than ideal risk and were targeted for risk reduction interventions. A risk reduction intervention program was designed and is outlined below (see Figure 3).

## **Conclusions**

A 10-year CHD risk probability can be calculated for an individual quite easily while gathering routine medical information. An employee population's CHD risk probability can be profiled graphically revealing high risk segments of the population who can be targeted for risk reduction interventions.

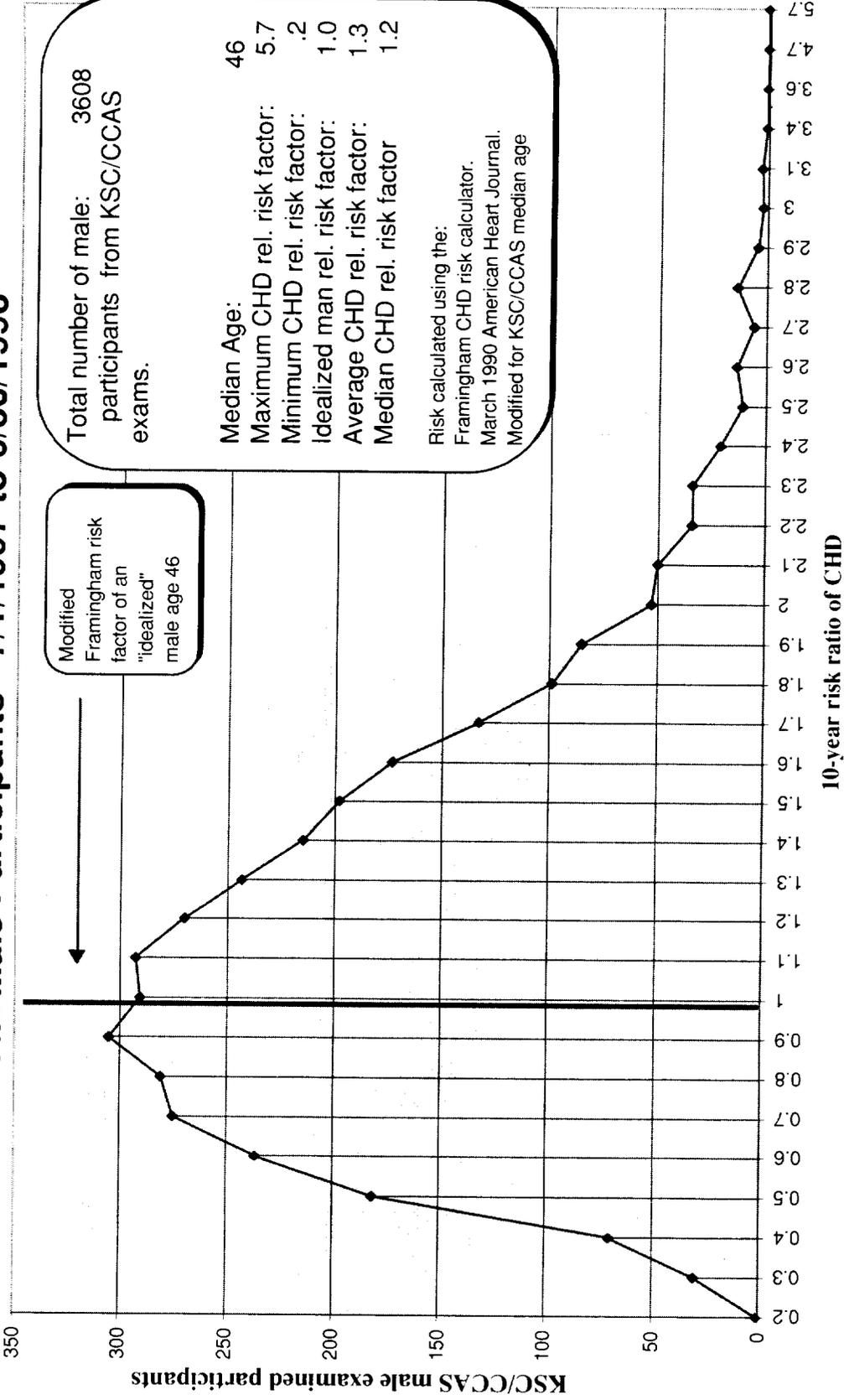
## **Recommendations**

The KSC Biomedical Office plans to begin CHD risk reduction interventions for high risk segments of the profiled KSC population. These interventions are outlined below (see Figure 3). Medical information will be collected throughout the year and these graphs will be reproduced periodically to allow continual reevaluation of the employee population and the effectiveness of risk reduction intervention efforts.

1. Levy, D, et al. "Stratifying the patient at risk from coronary disease: New insights from the Framingham Heart Study." *Am Heart J*, 1990, 119:712-7.

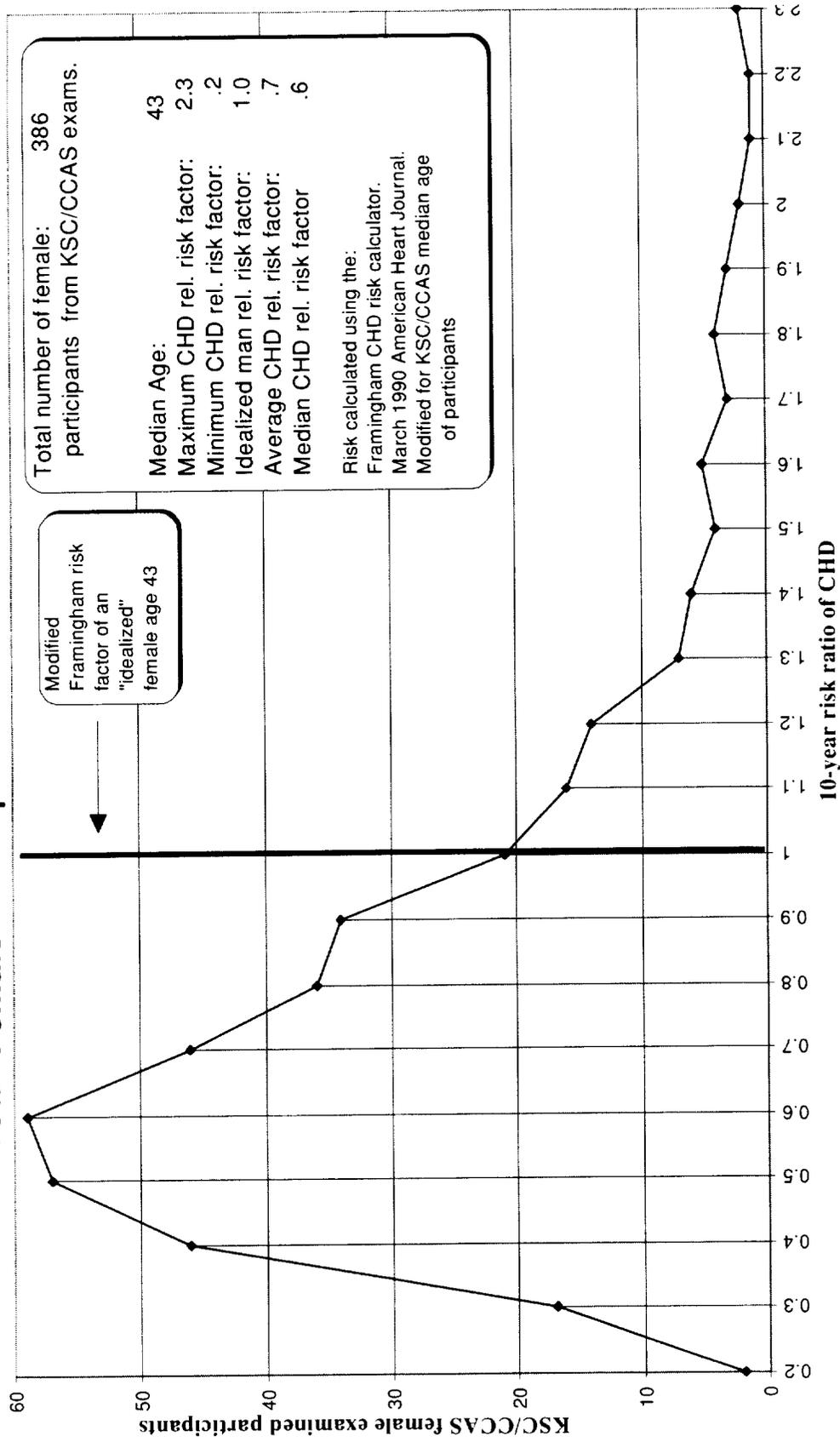
# KSC/CCAS Coronary Heart Disease (CHD) Risk Factors

## Total Male Participants - 7/1/1997 to 6/30/1998



**Figure 1**

# KSC/CCAS Coronary Heart Disease (CHD) Risk Factors Total Female Participants - 7/1/1997 to 6/30/1998



**Figure 2**

### **Figure 3**

## **Coronary Heart Disease Risk Factors Intervention Plan**

### **Above Risk Factor Level 1.5**

**Notify individual of increased risk**  
Provide package on risk reduction

### **Above Risk Factor Level 2.0**

Intervention as above  
In person counseling if exam scheduled  
Telephone counseling if no exam scheduled

### **Above Risk Factor Level 2.5**

In person counseling  
Work with individual on development of a risk factor reduction plan  
Work with individual and private physician for further follow-up of  
coronary heart disease screening as necessary

## **Monitoring and Modeling Astronaut Occupational Radiation Exposures in Space – Recent Advances**

**Mark Weyland**

Lockheed Martin

**Michael Golightly**

Johnson Space Center

In 1982 astronauts were declared to be radiation workers by OSHA, and as such were subject to the rules and regulations applied to that group. NASA was already aware that space radiation was a hazard to crewmembers and had been studying and monitoring astronaut doses since 1962 at the Johnson Space Center. It was quickly realized NASA would not be able to accomplish all of its goals if the astronauts were subject to the ground based radiation worker limits, and thus received a waiver from OSHA to establish independent limits. As part of the stipulation attached to setting new limits, OSHA included a requirement to perform preflight dose projections for each crew and inform them of the associated risks. Additional requirements included measuring doses from various sources during the flight, making every effort to prevent a crewmember from exceeding the new limits, and keeping all exposures As Low As Reasonably Achievable (a.k.a. ALARA – a common health physics principle).

The assembly of the International Space Station (ISS) and its initial manned operations will coincide with the 4-5 year period of high space weather activity at the next maximum in the solar cycle. For the first time in NASA's manned program, US astronauts will be in orbit continuously throughout a solar maximum period. During this period, crews are at risk of significantly increased radiation exposures due to solar particle events and trapped electron belt enhancements following geomagnetic storms. The problem of protecting crews is compounded by the difficulty of providing continuous real-time monitoring over a period of a decade in an era of tightly constrained budgets.

In order to prepare for ISS radiological support needs, the NASA Space Radiation Analysis Group and the NOAA Space Environment Center have undertaken a multiyear effort to improve and automate ground-based space weather monitoring systems and real-time radiation analysis tools. These improvements include a coupled, automated space weather monitoring and alarm system--SPE exposure analysis system, an advanced space weather data distribution and display system, and a high-fidelity space weather simulation system. In addition, significant new real-time space weather data sets, which will enhance the forecasting and now-casting of near-Earth space environment conditions, are being made available through unique NASA-NOAA-USAF collaborations. These new data sets include coronal mass ejection monitoring by the Solar and Heliospheric Observatory (SOHO) and in-situ plasma and particle monitoring at the L1 libration point by the Solar Wind Monitor (SWIM) and Advanced Composition Explorer (ACE) spacecraft. Advanced real-time radiation monitoring data from charged particle telescopes and tissue equivalent proportional counters will also be available to assist crew and flight controllers in monitoring the external and intravehicular radiation environment.

## Online Hazard Communication

**Daniel Woodard, MD**  
The Bionetics Corporation  
Kennedy Space Center

Maintaining paper indexes at every work site to comply with OSHA hazard communication requirements is costly and time-consuming. OSHA permits the use of electronic access for hazard communication, provided "the employee has prompt access to the Material Safety Data Sheet (MSDS)" for any potentially hazardous material in the workplace.

Strategies for providing hazard communication information at the work site include:

- Traditional paper binders
- Paper MSDSs obtained via fax when needed
- MSDSs displayed and read online at the work site

Paper binders are ultimately the most expensive approach, as a separate database must be maintained at every work site. Fax systems are widely available but slow, and don't generally reduce cost because the paper MSDS must be filed and maintained after it is received. Online access is fast and efficient but requires a computer to be located at or near the work site. Online access also requires that employees have access to the Internet, which some employers feel is undesirable.

Strategies for obtaining and storing hazardous communication (hazcom) information in electronic form include:

- Central database of scanned images of paper MSDSs
- Central database of MSDSs as electronic text files
- Links to manufacturers' web sites

Scanned images are easy to prepare from paper MSDSs received from manufacturers, but are inefficient in file size and access time, and image quality may be poor. MSDSs in electronic text are fast, efficient, and readable but difficult to create unless the manufacturer is willing to provide MSDS data in electronic form. A central database maintained by each employer for access from all its work sites provides reliable access, employer control, and efficient indexing however, maintaining the database is tedious and expensive and information is seldom fully current. Internet MSDS archives maintained by each chemical manufacturer for its own products are the most efficient approach. Only one archive per chemical manufacturer is required, and the information is always current. Unfortunately most manufacturers do not yet provide MSDSs on the Internet, and among those that do, document formats and indexing strategies vary widely.

Kennedy Space Center has established an online MSDS archive accessible by personnel at NASA Centers using a standard Web browser, with URL <http://msds.ksc.nasa.gov>. The site permits searches for MSDSs available by automated fax from an archive maintained by the Base Operations Contractor. Users may also search MSDSs available online in full text, or find links to manufacturer's MSDS web sites. We hope to persuade more manufacturers of chemical products to provide hazard communication information directly on the Internet, and to persuade NASA contractors to facilitate Internet access from the work site. The most efficient communication is that which allows information to flow directly from the original author to the final user.

## POSTER AWARDS

This year two equal awards were given for the best two of 23 poster presentations at the Conference. The authors displayed the posters over parts of three days at the Conference. These were reviewed and judged by a management team, no member of which was author or co-author of a poster presentation. Judging criteria were: relevance of topic, clarity of message communicated, supporting data, aesthetics of display, verbal interchange with the author(s), and validity and applicability of conclusions and summary. Award plaques were presented preceding the Keynote Address to the two 1998 poster award winners.

**Denise C. Brever, CIH**

Johnson Controls Inc., Stennis Space Center  
for her poster entitled  
“SSC Environmental Health Project Program”



**Philip J. Scarpa, MD, MS and Steven A. Field, MD, MSPH**

Biomedical Office, Kennedy Space Center  
for their poster entitled  
“The Need to Re-evaluate Non-responding Ergonomic Patients”



We congratulate these award winners on their superior presentations and thank all poster participants for their extra effort and contribution to the Conference.

## CONTINUING EDUCATION

**G. Wyckliffe Hoffler, M.D.**

Conference Technical Coordinator

The Bionetics Corporation, Kennedy Space Center

Earning continuing education credits can be a welcome byproduct of conferences. Many disciplines that are essential to support NASA operations, require maintaining and updating knowledge of personnel for licensure and certification. These requirements can be satisfied through various forms of continuing education. Official credits that satisfy requirements for professional licensure or certification must be authorized by a recognized organization. This usually implies academic liaisons and acknowledged expertise which are not generally available within NASA.

For personnel attending the Occupational Health Conference, we sought third-party accreditation for four professional disciplines. Physicians received credit through the Aerospace Medical Association, nurses through the American Association of Occupational Health Nurses, Inc., industrial hygienists through the American Board of Industrial Hygiene, and exercise specialists through the American College of Sports Medicine.

In each case, specific requirements were furnished to meet standards of the accrediting organization. These requirements assure that the instruction meets acceptable standards, that claimants' evaluations are returned, and that attendance is verified. Appropriate documentation was submitted to allow granting of continuing education credits. It is noteworthy that this was the first such offering by NASA for attending occupational health nurses.

The accompanying table shows the numbers of individuals claiming credit in each discipline. Cost for this type of instruction ranges from a few dollars per credit hour for self-paced, at home, sometimes "sterile" audio-visual instruction to hundreds of dollars per hour at specialty conferences. When travel and logistical costs are included, it is easily calculated that obtaining these continuing education credits alone resulted in visible cost savings for NASA. Relevancy of content and cross-fertilization activities provided less tangible gains. These secondary educational benefits clearly complemented the primary objectives of the Conference.

<u>Participant Category</u>	<u>No. Claimants</u>	<u>Credits Earned</u>	<u>Total</u>
Physicians	24	CME	503
Nurses	17	CEU	308
Exercise (Physical Fitness) Specialists	6	CEU	58
Industrial Hygienists	15	CE	43.5
Employee Assistance Counselors	6	PDH	126

## CENTER DIRECTOR'S TOUR OF KSC

**Alan G. Gettleman, MBA**  
Kennedy Space Center

A Center Director's tour of Kennedy Space Center (KSC), which included sites not normally accessible during regular tours for tourists, was conducted the last day of the Conference. Participants were able to view the nation's only manned space flight launch complex. Tour guides provided information on occupational health management of spacecraft and payload processing and research, as well as issues regarding astronaut occupational health.

An overview of manned spacecraft processing was provided during the tour of the Vehicle Assembly Building (VAB). Built for the Apollo missions, the VAB is 50-story building where KSC personnel perform the most hazardous portion of the Space Shuttle assembly—stacking of the solid propellant rocket motors together with the external fuel tank and the orbiter. The two rockets, containing approximately three million pounds of solid propellant, arrive in eight segments from the contractor in Utah. When final inspection and trimming of the dry propellant to specification is complete, the individual segments are stacked on the mobile launch platform. After full assembly and check out of all components, the Space Shuttle assembly is slowly transported to the launch pad, approximately three miles away.

Participants were able to view and touch an external tank in the VAB, which had recently arrived from the Michoud Assembly Facility located in New Orleans, Louisiana. The external tank is made of an aluminum alloy and contains two smaller tanks that hold cryogenic liquid hydrogen and liquid oxygen. These fuels propel the Space Shuttle's three main engines for the first eight minutes of flight. The external tank is maintained at constant internal pressure until the smaller tanks are filled to prevent collapse. It is mated to the solid rocket motors and filled with the cryogenic fuel and oxidant twelve hours before launch.

The next stop was Launch Complex 39, site of the John Glenn's return to flight mission (STS-95), scheduled for October 1998. Two identical launch pads, which are adjacent to the Atlantic Ocean, extend approximately 400 feet above the landscape. Launch Complex 39 was the site for launching Apollo missions to the moon. Upon completion of the Apollo program, it was redesigned for preparing Space Shuttles for launch, which number approximately 100 missions to date. Major health aspects of processing hazardous materials during Space Shuttle assembly were discussed.

KSC is located on the 150,000 acre Merritt Island National Wildlife Refuge, home of the largest number of threatened or endangered species in the continental U.S. As a result, high priority is given during Space Shuttle processing and operations to ensure protection of bald eagles (a nesting site was pointed out during the tour), alligators, manatees, sea turtles, wood storks and many other birds and animals.

The tour included a visit to the Saturn V facility, where one of the three remaining Saturn V rockets which took astronauts to the moon is preserved. A history of the manned space program was presented and included dynamic simulations of the Launch Control Complex activities during launch.

A highlight of the tour was a visit to the newly constructed Space Station Processing Facility. The first elements of the U.S. portion of space station, the "Node" from Marshall Space Flight Center in Huntsville, Alabama and components from the Italian Space Agency were being processed in the facility during the tour. Health aspects of long duration space flight were discussed.

KSC personnel are well trained in handling liquid hazardous materials. Toxic nitrogen tetroxide and toxic and hypergolic (spontaneously flammable upon exposure to an oxidant) hydrazines are routinely processed. These fuels are used for portions of the Space Shuttle's orbital maneuvering system or for fuel for various payload or rocket experiments. KSC personnel discovered that conventional, fully encapsulated proximity suits designed for protecting personnel from hazardous liquids do not provide the degree of protection required for long duration processing flows during Space Shuttle operations. KSC personnel designed a "state of the art" suit, locally called the Self-Contained Apparatus and Protective Ensemble (SCAPE) which provides increased protection.

Data on SCAPE operations have been collected for more than twenty years and are contained in a large database. It includes medical conditions of SCAPE operators, strict procedural guidelines for training, certification and use of the equipment, continuous radio and television coverage of operations, and total cleaning and refurbishment of SCAPE suits for reuse. Continual use and analyses of this information assure the routine safety of individuals working in extremely hazardous operations. A tour was provided of Hangar S, the facility where SCAPE suits are cleaned and tested.

As the duration of processing flows increased, conventional self-contained breathing apparatuses was not able to provide adequate protection. As a result, KSC personnel developed various means of supplying air, either continuously through supplied air hoses, or when additional mobility was needed, a liquid air pack providing at least one hour of respirable air. The technology used to develop long duration air supplies is being transferred to the private sector as a "spin-off" for use by fire fighters or other workers in similar hazardous conditions.

Considerable challenges for the occupational health community are provided by the hazardous nature of manned space flight and ground operations required to process space flight vehicles. Observing operations at KSC, which has one of the best safety records within the entire Federal Government, demonstrates NASA's high commitment to occupational safety and health. Personally viewing how occupational health practices are applied KSC was a fitting capstone to the week's activities for the NASA Occupational Health Conference.

## **PRE-CONFERENCE PROFESSIONAL DEVELOPMENT COURSE**

Course Chair: **Steven G. Brisbin, MS**  
Senior Environmental Health Officer  
Kennedy Space Center

A Professional Development Course was scheduled the day before the Conference began. Approximately 77 people representing the NASA Centers participated in the course. The speakers addressed a variety of topics related to chemical exposures in the workplace, and methods to evaluate the potential for adverse effects from these exposures. The course was designed for use as a guide to assess chemical exposure and anticipate adverse effects, workplace risks, or protective measures, as well as to provide insight into using current standards and requirements.

### **SESSION I**

**Dr. Christopher M. Teaf** from Florida State University  
presented the morning session entitled  
“Toxicology and Health-based Risk Assessment: Applications in the Workplace.”



### **SESSION II**

**Ms. Sharon J. Bessa** from Sharon J. Bessa & Associates, Inc.  
presented the afternoon session entitled  
“Resolution of Indoor Air Quality Problems: The Human Side.”



## SESSION I

### **Toxicology & Health-Based Risk Assessment: Applications in the Workplace**

**Christopher M. Teaf, PhD**

Center for Biomedical & Toxicological Research  
Florida State University

#### **Introduction & Principles of Exposure Estimation**

Although the term may not be universally familiar, “risk assessment” is practiced on a regular basis in the workplace, both in consideration of chemical and physical hazards. Occupational guidelines or standards, as promulgated by organizations such as OSHA or ACGIH, represent a fundamental form of risk assessment which defines the levels of acceptable exposure under assumptions of regular worker exposure. More specific forms of risk assessment are based upon specific “exposure estimation” that seeks to carefully define the actual duration and magnitude of exposure to an individual under a particular set of conditions. Exposure details will determine the estimate of intake, or absorption, and hence the associated potential health risk. Simply put, the mere presence of a chemical in the environment does not necessarily indicate that harm will occur. That determination can only be made on the basis of the case-specific exposure characterization.

Exposure to individuals may occur via ingestion (oral), breathing (inhalation) or skin contact (dermal), and there are major differences among chemicals with regard to the relative significance of each route of exposure. These differences typically are based on differences in physical and chemical factors (e.g., vapor pressure, water solubility), as well as the toxicological properties of an individual chemical which may affect absorption, distribution, metabolism and excretion of the substance. All factors which influence exposure also ultimately influence the “dose” or quantity of chemical that enters the body. The relationship between dose and effect (or “response”) is the principal concept of toxicology. By using the exposure information to estimate dose, it is possible to understand the likelihood of harm. Alternatively, by establishing acceptable doses and exposure circumstances in advance, it is possible to develop appropriate protective workplace protocols or requirements for protective equipment.

An example of one important piece of information in determining doses or risks is the concentration present in air. In compiling such information, it is crucial that the integrity of the concentration units be preserved during the analysis. For gases and vapors, it is possible to interconvert from units of ppm in volume to volume comparisons (=ppmv) to units of mass per volume (e.g., mg/m<sup>3</sup>). This conversion is based on molecular weight may be made according to the following expression:

$$y \text{ ppm} = (x \text{ mg/m}^3 \times 24.45 \text{ liters/mole}) / (\text{MW in grams/mole})$$

## **Exposures and Intakes: Comparisons with Occupational Standards**

Dose calculations must represent as accurately as possible the actual conditions of the exposure event. Toxicological effects may be “local”, occurring at the site of the contact, or “systemic”, where absorption and distribution may cause biological effects at one or more sites distant from the point of contact. For many sets of circumstances, occupational guidelines or standards may represent one point of departure for the development of initial dose calculations, insofar as they represent an upper range of potentially acceptable circumstances. This is complicated by the fact that many of the OSHA or ACGIH criteria are based upon transient phenomena such as odor or irritation which may have no linkage to persistent adverse effects. Additional limitations which must be considered regarding guidelines are that they do not consider possible multiple chemical exposures, they are based primarily on inhalation exposures, and they address potential carcinogenic effects on a threshold basis. That is, the assumption is made that there is a safe level which, if not exceeded, poses negligible risk. That approach is distinct from the standard approach of other entities such as U.S. EPA which address cancer on a nonthreshold basis, assuming that all exposures no matter how small, are associated with some degree of risk.

One example discussed during this segment of the course was toluene, a very common noncarcinogenic chemical which is a component of many solvents, petroleum fuels, adhesives and household products. Transient, reversible irritation has been reported at concentrations equal to or less than 100 ppm, while neurological effects typically are not reported at less than 200 ppm for extended periods. A second example was vinyl chloride, which may cause low level neurological effects at several thousand ppm, and which is recognized as a known human carcinogen in some chronic, high level industrial exposures. Algorithms and standard assumptions for estimation of dose were presented for these chemicals.

## **Analytical Data & Information Sources: The Good, the Bad and the Ugly**

The foundation upon which the best dose estimates are made is the sampling and analysis of air or other media to which exposure may occur or may have occurred. Such data may help to minimize speculation about the magnitude of exposure, but all data must be subjected to rigorous scrutiny. Considerations of sampling and analysis methods, proper suites of analytes, selection of sampling locations, verification of sampling conditions, and demonstration of data reproducibility are examples of the important criteria which must be satisfied. In addition, accurate chemical nomenclature, presentation of the appropriate units, and comparisons with correct standards are essential to workplace exposure evaluations. Two somewhat facetious quotes serve to illustrate important concepts of sampling and analysis verification: “You’ll never detect something that you don’t analyze the sample for” and “Bad data are worse than no data.”

Two case studies were presented. The first example related to the application of an inappropriate analytical method which failed to detect a pesticide that was strongly believed to be present. That failure to detect the substance caused the consultant to draw a wrong conclusion which was very expensive for the client. A second example addressed the confusion that may occur during the analysis for common petroleum hydrocarbons if

the sampling technician or the analytical chemist is not sufficiently familiar with the advantages and disadvantages of various available detection methods.

There are many potential sources of occupational medicine data and valuable health-based information. Beginning with Material Safety Data Sheets (MSDS) and product labels, both of which may vary considerable in terms of quality, working up through handbooks and readily available summary materials, finally culminating in standard library reference texts, there is a wealth of data on common chemicals. However, of the nearly 100,000 chemicals which are presently in the universe of world commerce, there is adequate chemical and toxicological information available on perhaps a thousand, and lesser but nevertheless useful information on an additional thousand. More recently, computer-based searching tools (e.g., Internet, agency on-line databases) have made huge quantities of information available. Though the costs are typically low and volume of data is great, it often is difficult to verify the source and accuracy of such information, and the user should exercise caution. An often-overlooked source of information is the open scientific literature, which may require selected specialists (e.g., toxicologists, epidemiologists, medical staff) for proper data interpretation and for reconciliation of potentially conflicting data from multiple sources. The sophistication and experience of the anticipated audience (e.g., attorneys vs. plant personnel) may dictate selection of the most appropriate source of physical/chemical or toxicological information.

### **Risk Assessment: Combining Exposure Information with Chemical Data**

The estimation of dose, and hence risk, is often strongly dependent upon reliable information regarding physical/chemical properties of the substance or substances, as well as the toxicological attributes. In addition to the typical guidelines such as the ACGIH TLV and the OSHA PEL, there are useful values developed by U.S. EPA including the Reference Dose (RfD) and the Cancer Slope Factor (CSF). These may be use to calculate parameters such as the potential carcinogenic risk and the Hazard Index.

Comparison between occupational guidelines and acceptable doses, as they may be calculated by U.S. EPA risk methods, yields some interesting results. For instance, the risk calculated in the case of inhalation exposure to vinyl chloride by U.S. EPA methods for a general occupational individual is in the range of  $10^{-2}$  to  $10^{-3}$ , or perhaps 1,000 to 10,000-fold greater than would be acceptable under normal circumstances of environmental contamination cases (e.g.,  $10^{-5}$  to  $10^{-6}$ ). Similarly, given the inhalation intake of toluene at the airborne occupational guideline concentration, the calculated risk from toluene is approximately 6-7 times greater than generally would be acceptable under U.S. EPA guidance for an environmental case.

A practical example was discussed to evaluate the potential exposure to volatile contaminants that may be present on the basis of using contaminated groundwater for the manufacture of commercial cement. The conclusion from the assumptions and data that were presented was that only limited volatility occurs under reasonable circumstances. Depending upon the actual concentration of analytes in the water, by the time the curing process is underway and even partially finished, the airborne chemical concentrations are extremely low, and would not be of significant human health concern.

## **Management of Potential Exposures: Protection & Litigation**

Risk assessment for the evaluation of chemical exposures in the workplace may be used as a protective measure to ensure that unacceptable exposures are minimized or eliminated, and also may be used to guide in the selection of workplace procedures or equipment designed to minimize exposure and to control risk. It also may be used in the legal arena to determine whether an alleged set of exposure circumstances was of toxicological significance, and whether any injury may be presumed to have occurred. Accurate assessments are generally limited by the recollection of individuals, unless sampling data are available for the specific time period of interest. Allegations of health effects should be evaluated with an open mind. A crucial distinction in toxicology and risk assessment is the difference between an “association”, which simply describes a complaint coupled with an exposure event, and “causation”, which reflects a range of considerations designed to demonstrate that **ONLY** the chemical of interest can have caused the observed effect. This balance must be struck because otherwise one may run into the case of “I’m sick and there are chemicals here; therefore, the chemicals must have made me sick”. Several of the necessary aspects of “proof” for the demonstration of causation are “biological plausibility” (Could it have happened?), “exposure” (Did some contact occur and how much, by what route of exposure?) and “temporality” (Did the exposure occur prior to the observed effect?).

A number of case examples were discussed including pesticide application cases, use of paraffin-impregnated wallboard and the associated inhalation of fumes generated during the cutting process, as well as ongoing reported neurological illness as a result of solvent exposures to copier repair individuals.

## **Synthesis: Where Do We Go From Here**

Several summary points serve to draw together the wide range of topics that were discussed during the course:

- As always, care and proper definition of the problem to be solved is critical to a solution, and sampling simply for the sake of sampling may not be beneficial without appropriate planning.
- Occupational guidelines are just that – guidelines. However, existing occupational standards are technically and legally enforceable. In either case, mere adherence to the criterion does not guarantee safety and, conversely, exceedance of the guidelines or standards does not necessarily mean that there will be injury. Biological variation and differences in individual sensitivity may play a major role in our uncertainty regarding acceptable doses.
- Risk assessment is designed to evaluate the conditions and consequences of exposure, in the context of preparing a set of recommendations concerning the likelihood of harm. The process can be carried out prospectively, perhaps to determine an acceptable set of conditions. It also can be carried out in retrospect, in order to estimate exposure and to evaluate the likely health consequences that may have occurred from a presumed exposure event.
- Risk assessment and occupational health studies are only as good as the information which is used in their preparation. Therefore, it is essential to ensure that the sampling, analysis, and interpretation of the results are of the highest quality.

## SESSION II

### Resolution of Indoor Air Quality Problems: The Human Side

Sharon J. Bessa, CIH, COHN  
Sharon J. Bessa & Associates, Inc.

#### History and Evolution of the Problem

The types of problems seen in indoor air quality investigations in the 1990's are not new. Similar complaints and events have occurred in the past. Investigators' approaches have often been too simplistic with the underlying cause considered to be either strictly psychological or environmental.

#### 15-16th Century: Tarantism

This malady, epidemic in southern Italy, was characterized by an uncontrollable urge to dance and was thought to be caused by a spider bite.

#### 1950s: Mass Hysteria

The word "hysteria" originates from the Greek "hysterikos", meaning "of or suffering in the uterus". In ancient Egypt, diseases without a cause were thought to be due to a "wandering uterus."

School children were especially vulnerable with 60 percent of reported outbreaks (Small and Borus 1983). Also known as "hysterical contagion", these were events where two or more individuals in a group experienced subjective, non-specific symptoms that were transitory, associated with an environment, frequently triggered by an odor.

#### 1960s: Mass Psychogenic Illness

We became more sophisticated and the old term "hysteria" began to be replaced by the term "psychogenic." These outbreaks were also known or described as:

- Behavioral Contagion
- Collective Delusion
- Collective Stress Reaction
- Group Conversion Reaction
- Epidemic Transient Situational Disturbance

1968: Kerckhoff and Back in the "*The June Bug*" described an outbreak that took place in a southern textile plant. A very extensive study of "hysterical contagion," this outbreak began with reports of insects being seen in the plant, then one individual reported a "bug bite." The insect "nuisance" spread until it became a threat in the form of poisonous bugs. Eventually the plant was evacuated and the local media became involved.

The authors completed an extensive review of the evolution of this group behavior. They developed 11 postulates to explain how the belief that poisonous insects had invaded the plant became so widely accepted in this population.

### **1970s to 80s: Environment is the Problem**

Debate began over ascribing these events to psychosocial causes. Several events supported the conclusion that the environment was the source of the complaints:

1. 1974: Energy Crisis - this led to "tight buildings."
2. 1976: Legionnaire's Disease - presented solid proof that buildings can cause illness.
3. The discovery and fear of environmental pollution like that seen at Love Canal reinforced the notion that toxic chemicals are a constant threat to our health. (We are not safe – even in our communities.)
4. Formaldehyde in mobile homes. (We are not safe in our homes.)
5. The creation of NIOSH resulted in extensive testing for environmental factors to explain what had previously been thought to be caused by psychological factors.

#### NIOSH Studies on Indoor Air Quality:

Before 1978	4 Studies
1978-1984	Over 300 Studies
1980-1986	Findings in 300 Studies
Inadequate Ventilation	50%
Inside Source	19%
Outside Source	11%
Biological Source	5%
Building Fabric Source	4%

### **1990s:**

In the 1990s we began to classify Indoor Air Quality (IAQ) investigations into two categories based on whether the occupants' medical complaints would point to a specific causative agent in the building. The categories appeared to assume that the only question was whether one specific agent could be identified and found - not on whether the building was the source of the agent.

#### Building Related Illness

1. Specific medical condition  
e.g., Legionnaire's Disease
2. Known etiology or cause  
*Legionella pneumophila*
3. Signs and laboratory findings

#### Sick Building Syndrome

1. Symptoms: Subjective complaints
2. Diagnosis: Not mainstream, e.g., "multiple chemical sensitivity"
3. Etiology or cause is unknown

One study published in *JAMA* in December 1990 by Black, Rathe, and Goldstein titled "Environmental Illness: A Controlled Study of 26 Subjects with "20th Century Disease" challenged the assumption that the environment was the cause. They concluded, "patients receiving this diagnosis may have one or more commonly recognized psychiatric disorders that could explain some or all of their symptoms."

The response to this study suggested that this was an example of the chicken versus the egg question: who wouldn't have psychological problems after becoming sensitized to the environment?

### **Environmental vs. Psychological**

Why do we prefer an environmental cause as the explanation for IAQ complaints?

1. Employee/employer relationship ... Is this work related?
2. Since there is usually an employer/employee relationship, our workers' compensation system forces us to make a clear decision regarding the work-relatedness of the complaints.
3. Education of industrial hygienist is focused on the environment
4. Cultural norm: "This is not my fault."
5. Environmental factors = Objective data
6. Environmental Factors = Easier to fix than psychological factors
7. Psychological problems = Unacceptable weakness

### **To Resolve Indoor Air Quality Problems:**

While anticipating, recognizing, evaluating and making recommendations for control of the environmental factors...

use this same problem-solving approach to assess and manage the psychosocial aspects of these events.

### **The "Human Side" Of Resolution**

Characteristics of cases that are not resolved by improving the environment:

1. Initial response inadequate
2. Investigations inadequate (or perceived to be inadequate)
3. Anger ... Fear ... Distrust
4. The group is formed, takes over
5. Goals have changed

## **Indoor Air Quality Progression**

If psychological and social factors are not considered, occupants in a building investigation progress through five stages:

- Stage One:     The Trigger**  
Directs attention toward the environment  
Sets things in motion
- Stage Two:     The Promotion**  
Reinforcement of the idea that the problem is the environment.
- Stage Three:   The Reaction**  
Perceived inadequate response  
Anger and polarization
- Stage Four:     The Spread**  
Escalation of the conflict  
Anxiety, panic and fear
- Stage Five:     The Undesirable Resolution**  
Loss of control  
Third party involvement

### **Stage One: The Trigger**

#### **Odor**

Sets occupants up to believe that identification through air sampling is possible.

#### **Bugs**

#### **Person**

1. Death, especially from cancer
2. Miscarriage, birth defects
3. Illness
4. New hire or temp - "never sick before"

#### **Symptoms**

1. Nose bleed
2. Mucous membrane irritation
3. Headache
4. Sinus congestion

#### **Event**

1. Remodeling, renovation, move into new location
2. Asbestos abatement
3. Testing of soil, water
4. Change, stress

## **Stage Two: The Promotion**

### **Media**

1. Television
2. Magazines
3. Newspapers
4. Internet

### **Co-Workers**

Especially powerful if supervisor or other person in authority is affected.

1. Triggers and promoters
2. E-Mail

### **Physicians and Other Health Care Providers**

### **Haz Mat Response**

### **Supporting Evidence**

1. Black stuff on ceiling tiles by supply diffusers
2. Bugs
3. Colds and flu
4. Dust
5. Warning labels or bags

### **Consultants**

### **Occupants Removed from Area or Building**

## **Stage Three: The Reaction**

### **Occupants Not Satisfied with Response**

#### **Anger Polarization**

#### **"Group" is Formed to Solve the Problem**

#### **Cause is Identified**

May or may not be related to trigger but there is often some relationship.

1. Specific location
2. Distinct activity
3. Single agent

#### **Solution is Identified**

## **Stage Four: The Spread**

### **More Occupants**

1. Group convergence
2. Group contagion

### More Symptoms

1. Everything is now blamed on the "cause".
2. Bizarre sounding symptoms: teeth buzz, scalp hurts, "My face blew up!"
3. Response does not make sense in terms of time and space.

### More Promoters

### More Causes Identified

May progress to the entire building.

### Fear Distrust, Allegations of a Cover-up

### Beliefs about Cause and Solution

## Stage Five: The Undesirable Resolution

### Desirable

Everyone wins.

### Undesirable

When the above does not happen.

1. Loss of control
2. Third party (promoter) involved with vested interest in polarization

## Consulting Styles

### Expert

Works well in Stages 1 and 2 - occupants are open to facts

Works well on environmental aspects in other Stages

### Facilitator, Catalyst (change agent)

Necessary in Stages 3, 4, 5 for Human Side

## Goals

### Stages One and Two

Goals of Management	Goals of the Occupants	Goals of the Consultant
Quick Resolution: Problem identified and fixed =	1. Quick Resolution: Problem identified and fixed 2. Reassurance of no adverse effects later in life	Environment: Identify problem, fix it  Human Factor: 1. Prevent progression 2. Minimize the impact on the entire building 3. Desirable solution

### Goals Stage Three

Goals of Management	Goals of the Group	Goals of the Occupants
Quick Resolution: Problem identified and fixed	<ol style="list-style-type: none"> <li>1. ATTENTION!!!</li> <li>2. Thorough investigation</li> <li>3. Problem identified and fixed</li> <li>4. Reassurance of no adverse effects later in life</li> </ol>	Human Factor: <ol style="list-style-type: none"> <li>1. Prevent progression</li> <li>2. Minimize the impact on the entire building</li> <li>3. Desirable solution</li> </ol> Environment: Identify problem, fix it

### Goals Stage Four

Goals of Management	Goals of the Group	Goals of the Occupants
<ol style="list-style-type: none"> <li>1. Confirm their findings (Prove that I am right.)</li> <li>2. Relief from anger and frustration</li> </ol>	<ol style="list-style-type: none"> <li>1. ATTENTION!!!</li> <li>2. Thorough investigation</li> <li>3. Quick resolution of the problem that <i>they</i> identified as the cause.</li> </ol>	Human Factor: <ol style="list-style-type: none"> <li>1. Prevent progression</li> <li>2. Minimize the impact on the entire building</li> <li>3. Desirable solution</li> </ol> Environment: Identify problem, fix it

### Goals Stage Five

Goals of Management	Goals of the Group	Goals of the Occupants
<ol style="list-style-type: none"> <li>1. End my pain.</li> <li>2. Prevent legal action.</li> </ol>	RETRIBUTION!	Human Factor: <ol style="list-style-type: none"> <li>1. Prevent progression</li> <li>2. Minimize the impact on the entire building</li> <li>3. Desirable solution</li> </ol> Environment: Identify problem, fix it

## **Intervention First Contact**

### **Objectives**

1. Helpful (you want to solve the problem!)
2. Identify the Stage: 1 & 2, 3 or 5  
Stage 4 may not be accurately identified - situation tends to be exaggerated or underestimated during this first contact.  
Client is asking for help.
3. Prepare them for the fact that you will be talking about the "psychosocial" aspects:  
"Sounds like people are really upset about this."  
"Empathize with their "frustration."  
Use the word "frustration" rather than "anger."  
Don't be confrontational: "You really have some psychosocial problems here!"

### **Next Steps**

1. Management Meeting
2. Occupant Meetings

## **Data Gathering**

This is an Intervention!!

### **Surveys**

1. Advantages
  - covers a large number of people
  - consistent collection
  - saves time
2. Disadvantages
  - impersonal (and what do people need most at this stage??)
  - leading questions are often used
  - raises expectations that all problems will be addressed and solved
3. Use only if:
  - supplemented by personnel meetings
  - individual interviews are offered
  - all concerns are addressed

### **Interviews**

1. Advantages
  - provide ATTENTION
  - use open-ended questions
2. Disadvantages
  - time-consuming (expensive)
  - harder to collect consistent data

## Diaries

1. Advantages
  - open-ended
  - gets occupant involved
  - can identify who is really suffering
2. Disadvantages
  - inconsistent data
  - impersonal

## Intervention

Intervention means using the right approach to effect positive change.

### Appropriate intervention requires:

1. Stage recognition
2. Goal identification at that stage

### Consider Goals for Three Parties

1. Management (those responsible for making changes)
2. Building Occupants
3. Consultant

### Goals of Intervention for Consultant

1. Halt the progression
2. Minimize the impact of IAQ investigation on the rest of the building.
3. Desirable resolution

### Intervention begins with the first contact.

Hawthorne Studies

### Who is the Client?

1. Contact client
2. Primary client
3. Accessory client
4. Ultimate client

### Solution Progression

Objective data is available to tell you when your intervention is working.

## Intervention Stages One and Two

Intervention with Management	Intervention with the Occupants
May need very little.  If necessary, educate on the stages of progression. Agree on the goal of preventing progression to Stage 3.	Open communication. Collect their information. Identify promoters – address them. Education on: health problems their building limitations of investigations

### Intervention Stage Three

Intervention with Management	Intervention with the Group
<p>Point out that “conflict resolution” is the first goal.            Educate them about the progression.            Give them support and kudos for all their “unappreciated” efforts.            Give them the “ground rules” for the Pressure Relief Meeting.</p>	<p>Pressure Relief Meeting – then:            see intervention for Stages One and Two.            Informational Meetings            Closing Meeting</p>

### Intervention Stage Four

Intervention with Management	Intervention with the Group
<p>See Stage 3            Guide them to distinguish the difference between escalation of conflict and escalation of an environmental problem.</p>	<p>See Stage 3            Listen for “cause.”            Listen for “solution.”            Identify who is suffering: acknowledge anger, fear, loss            Wait until the group is ready to hear facts.            Get the occupants involved in the solution.            Working Meetings            Closing Meeting</p>

### Intervention Stage Five

Intervention with Management	Intervention with the Group
<p>If you have a choice: decide if you want to get involved.            Set firm ground rules.            Insist that someone skilled in conflict resolution work with you.</p>	<p>Identify third party promoters with vested interest in maintaining the polarization.            Establish mutual goals.            See Stages Three and Four.</p>

## **Pressure Relief Meeting**

This is the first occupant meeting if the group has progressed to Stage 3 or beyond.

### **Objectives**

1. Give occupants a chance to be heard
2. Establish trust
3. Acknowledge shared frustration
4. Establish mutual goals between management and occupants

### **Expect:**

You will be raked over the coals, dragged through the wringer, chewed up and spit out - and that's if it is a GOOD meeting!

You will have great difficulty keeping silent.

### **Ground Rules**

1. Keep silent as much as possible.
2. Do not argue or get defensive (same thing).
3. Keep presentation of facts to a minimum. Wait until you get signs that they are ready to accept your facts.
4. Find a way to quickly build trust.
5. Assure a thorough investigation.
6. Assure open communication.
7. Plant the seed that you expect their involvement in solving the problem.
8. Explain the next step.

### **Keep in mind the beliefs that are behind the "unmet needs" (goals):**

Management does not care.

The building is sick and they have not taken care of the problem.

This is one more piece of evidence that they do not care.

## **Informational Meetings**

These are held only after occupants have been allowed to defuse their anger by having their primary need for attention satisfied.

### **Provide Information**

1. About yourself
2. Method of investigation
3. Building problems

Examples:

- ventilation
- humidity
- assessment of allergens

4. Health problems

Examples:

- allergies/asthma
- effects of low humidity
- effects of working on computer

## 5. Investigation findings and recommendations

### DO THIS IN WRITING:

- To minimize misunderstandings
- To demonstrate that there is a strategy for conducting the investigation

### **Solicit Their Assistance**

1. Data gathering
2. Air sampling

## **The Working Meetings**

These are held to solicit active participation of the occupants. They are used when it appears that the environmental problems have been identified and resolved but the occupants still believe that there is a problem in the building.

Brainstorm but have a framework in which to organize the information.

### **Objectives**

1. Make it clear: This is a “group” project that is being tackled by a “team.” Group needs to make a commitment to the project.
2. Clarify the overall goal, the “charge” of the group. Work through the wording together. Occupants will often say that their goal is “Clean Air.”
3. Identify those items that will be used to indicate when the goal has been met.  
How will you know when you have “Clean Air”??  
This often requires going back to make some adjustments in the wording of the overall goal.  
“Clean Air” to “Air that is typical of an office building” (as opposed to outside air or “factory” air)

This leads to the discussion of whether or not “symptom-free” (usually one of the indicators mentioned) is a reasonable way to gauge whether or not the air is “OK.”

### **Clarify Roles (and Responsibilities)**

1. Consultant  
e.g., will perform the following measurements...
2. Management  
e.g., will arrange for payment and scheduling of the medical evaluations
3. Others: Housekeeping, etc.  
e.g., will begin using a high efficiency vacuum cleaner
4. Occupants  
e.g., will keep a log of concerns, will undergo a medical evaluation

## **Stage Progression and Intervention with Individuals**

### **Active Individuals**

#### 1. Characteristics

- they are in charge of their health care
- they are often on a "search for cause" of illness, miscarriage, etc.
- very compliant with instructions
- they want to get well - fix things themselves if necessary
- rally support amongst co-workers

#### 2. Intervention

- assist them in their search
- educate them - usually very hungry for facts - bring them articles to read
- have a "working meeting" with them - get them to describe their criteria for an "OK" building environment

### **Passive Individuals**

#### 1. Characteristics

- often clinically depressed
- many have been doctor jumping
- symptoms complicated by drugs - prescribed and over the counter
- symptoms complicated by smoking
- do not comply with your advice or their doctors' advice
- want someone else to fix things
- rally support amongst co-workers

#### 2. Intervention

- don't be an "enabler"
- give very clear, written instructions
- tell them that their response to the environment cannot be accurately evaluated until they quit smoking
- must have adequate medical evaluation
- have a "working meeting" with them

### **Medical and Human Resource Issues**

Do not allow management or the occupants to force the application of industrial hygiene investigation techniques to a situation that is, in fact, a medical or human resource problem.

## Closure (Closing Meeting)

### Objectives

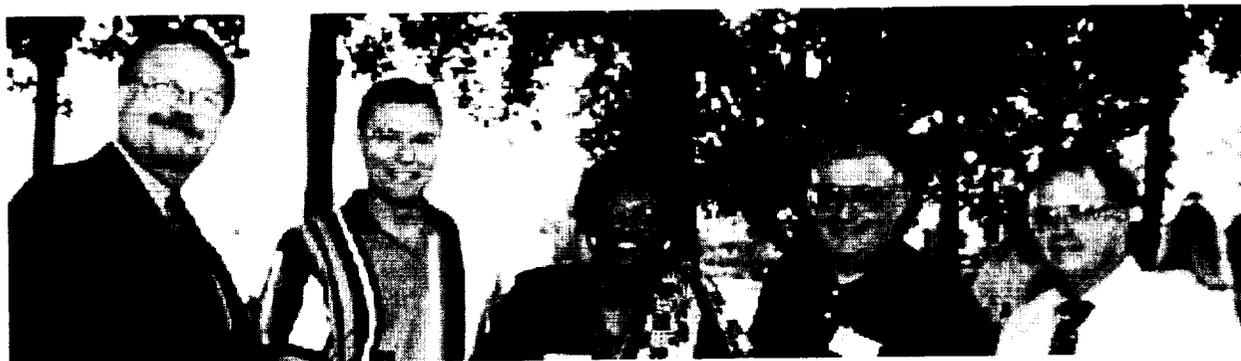
1. Obtain "Closure", a sense of completion
2. Send the message that the investigation has been completed, that the building is "OK".

### Procedure

1. Call it the "Closing Meeting."
2. Summarize all findings, conclusions, and recommendations.
3. Address any unresolved questions:  
Don't be afraid to say: "I don't know why you are fatigued every afternoon."  
"What I do know..."
4. Address the fears of long term effects and reproductive health effects.  
Once again, a lot of "I don't know" but "from the literature...", or "from what we do know about similar chemicals ..." etc.
5. Remind them to trust their bodies - "Listen to your body." Remind them to try to sort out annoyance from health threat.
6. Remind occupants that "symptom-free" is not a reasonable goal. Allergy symptoms may typically be found in 20-30% of any building occupant group.
7. Building re-entry issues - May need additional assistance with some individuals if the building has been evacuated. May need to address Post Traumatic Stress Disorder.
8. Identify and discuss prevention efforts. This is especially important if the incident was traumatic.

## WELCOME RECEPTION

A welcome reception was held in the evening of August 24, 1998. A social hour and buffet dinner for 135 participants and family members provided time to meet old friends and to meet those new to the program. Ms. Diana Giammarco was asked to take photographs during the Conference as well as during the welcome reception. Her photographs are included in the previous sections. She did an exceptional job and with a note of special thanks to her, we include some of the photographs taken during the reception.



Dr. Bill Barry, Dr. Mike Rappa, Dr. Irene Long, Dr. Arnauld Nicogossian,  
and Dr. Rich Williams



Dr. and Mrs. Bud Ferguson, Dr. Chuck Smallwood, and Mr. and Mrs. Bill McGuire



Mary Davidson, Dr. Jim Moeller, Terri Ross, Gayle (Jeri Huneycutt's sister)  
and Antoinette Mayor



Sheilla Goldberg, Jackie Reese, Sean Keppta,  
Tim Donohoe, and Rebecca Siemens



Sue Frahm, Carol Roth, Mr. and Mrs. Bob  
Martin, and Carol's son Stephen



Dr. Larry McManus, Mike Moore, Joyce Eagan, and Mr. and Mrs. Ben Anderson



Mr. and Mrs. Mike Cardinale, Luz Jeziorowski, John Sherwood, and Bette Davis



Dr. Bill Barry, Mr. and Mrs. Jim CoVan, Dr. John Cinco, and Dr. Dave Tipton



Susan Harper with children Amanda and Aaron, and Dr. Don Sweeney



Bruce Kelly, Carl Ruf, Paul Fagiolo, Jay Leung, and Dr. Matt Taquino



Miriam Glazer, Claire Sloboda, and Beverly Damewood



Dr. Wyck Hoffler, Michele O'Donnell, and Dr. Dave Tipton



Dr. Rich Williams, Dr. Bill Christensen, Dr. Mike Rappa, Dr. Irene Long, Alan Gettleman, Cathy Angotti,  
George Mamaro, Dr. Nicogossian, Dr. Wyck Hoffler, and Sam Haddad

## CONFERENCE PARTICIPANTS

Approximately 150 health professionals, guest speakers, management officials, and support personnel participated in this annual NASA Occupational Health Conference. The NASA Occupational Health Program Office at Kennedy Space Center planned, managed, and hosted the Conference.

The following table indicates the number of participants in the discipline areas.

Physicians	32
Industrial Hygienists	55
Registered Nurses	16
Employee Assistance Counselors	11
Exercise (Physical Fitness) Specialists	5
Contracting Officer's Technical Representatives	8

The accompanying list of participants includes all those who registered for the Conference, though some were unable to attend. The list includes position, current affiliation, and addresses which may be useful for further contact or for obtaining additional information.

Mr. John Abeles  
Vice President, Parallax, Inc.  
Occu-Health, Inc  
24 Frederick Road  
Ellicott City, MD 21403

Dr. William S. Barry  
Occupational Health Program Office  
Mail Code JJ-H  
NASA Kennedy Space Center  
Kennedy Space Center, FL 32899

Ms. Thea B. Adams  
Family Nurse Practitioner  
Zel Technologies, Mail Code 281  
NASA Langley Research Center  
Hampton, VA 23665-5225

Mr. William V. Bates, Jr.  
Chief of Staff  
International Space Station Program  
Mail Code OA  
NASA Johnson Space Center  
Houston TX 77058

Mr. Thomas W. Ambrose  
Chief, Safety, Health, and Environmental Office  
Mail Code D-2152  
NASA Dryden Flight Research Center  
Edwards, CA 93523-0273

Dr. Marilyn E. Bell  
Wordsmiths Training and Consulting  
P.O. Box 21382  
Detroit, MI 48221

Mr. Ben Anderson  
Compliance Administrator, Kelsey Sebold  
Mail Code AT010M- Building 4249  
NASA Marshall Space Flight Center  
Huntsville, AL 35812

Mr. Michael A. Bell  
Manager, Benchmarking & Metrics  
Mail Code AG  
NASA Kennedy Space Center  
Kennedy Space Center, FL 32899

Ms. Catherine M. Angotti  
Program Executive, Occupational Health  
Mail Code UO  
NASA Headquarters  
Washington, DC 20546

Ms. Wendy P. Benison  
Industrial Hygienist  
United Space Alliance, Mail Code USK-142  
NASA Kennedy Space Center  
Kennedy Space Center, FL 32899

Dr. Arthur A. Arnold, Jr.  
Manager, Medical Operations Office  
Bionetics Corporation, Mail Code BIO-1  
NASA Kennedy Space Center  
Kennedy Space Center, FL 32899

Mr. Gary I. Bergstrom  
Environmental Health Engineer  
EG&G, Mail Code BOC-022  
NASA Kennedy Space Center  
Kennedy Space Center, FL 32899

Mr. Mark G. Artley  
Technical Advisor, Conference Staff  
Bionetics Corporation, Mail Code BIO-3  
NASA Kennedy Space Center  
Kennedy Space Center, FL 32899

Ms. Sharon J. Bessa  
Sharon J. Bessa & Associates, Inc.  
P.O. Box 620250  
Middleton, WI 53562

Dr. James C. Baker  
Project Manager  
Kelsey-Sebold, Mail Code SD22  
NASA Johnson Space Center  
Houston, TX 77058

Ms. Brenda R. Blair  
Blair & Burke  
P.O. Box 9927  
College Station, TX 77842

Mr. Michael Blotzer  
Industrial Hygiene, Team Leader  
Mail Code 6-4  
NASA Lewis Research Center  
21000 Brook Park Road  
Cleveland, OH 44135

Ms. Denise C. Brever  
Senior Industrial Hygienist  
Mail Code JCWS  
NASA Stennis Space Center  
Stennis Space Center, MS 39529

Mr. Roy D. Bridges, Jr.  
Center Director, Kennedy Space Center  
Mail Code A-A  
NASA Kennedy Space Center  
Kennedy Space Center, FL 32899

Mr. Steve G. Brisbin  
Senior Environmental Health Officer  
Occupational Health Program Office  
Mail Code JJ-H  
NASA Kennedy Space Center  
Kennedy Space Center, FL 32899

Mr. Douglas L. Britt  
Project Director  
Dynamac Corporation, Mail Code DYN-1  
NASA Kennedy Space Center  
Kennedy Space Center, FL 32899

Mr. John J. Burke  
Blair & Burke  
P.O. Box 3326  
Topsail Beach, NC 28445

Mr. Guy S. Camomilli  
Safety, Quality and Engineering Comp.  
Dynamac Corporation, Mail Code DYN-1  
NASA Kennedy Space Center  
Kennedy Space Center, FL 32899

Mr. Michael A. Cardinale  
Industrial Hygiene Officer  
Biomedical Office  
Mail Code JJ-C-1  
NASA Kennedy Space Center  
Kennedy Space Center, FL 32899

Mr. Gary L. Carl  
Safety and Occupational Health Specialist  
Mail Code 429  
NASA Langley Research Center  
Hampton, VA 23681-2199

Ms. Meredith R. Caukin  
Environmental Health Engineer  
EG&G, Mail Code BOC-022  
NASA Kennedy Space Center  
Kennedy Space Center, FL 32899

Mr. John P. Chewuk  
Environmental Health Specialist  
EG&G, Mail Code BOC-022  
NASA Kennedy Space Center  
Kennedy Space Center, 32815

Dr. William D. Christensen  
Vice President  
Life and Environmental Sciences  
Bionetics Corporation  
11833 Canon Blvd., Suite 100  
Newport News, VA 23606

Dr. John T. Cinco  
Flight Surgeon, Biomedical Office  
Mail Code JJ-C  
NASA Kennedy Space Center  
Kennedy Space Center, FL 32899

Dr. Steve Conway  
Senior Medical Officer  
Occu-Health, Inc.  
24 Frederick Road  
Ellicott City, MD 21043

Ms. Linda Cooper  
Occupational Health Consultant  
Mail Code UO  
NASA Headquarters  
300 E Street, SW  
Washington, DC 20546

Mr. James P. CoVan  
Environmental Health Manager  
AJT & Assoc., Mail Code AT010M  
NASA Marshall Space Flight Center  
Huntsville, AL 35812

Ms. Joanne W. Creech  
Manager, Environmental Health Services  
EG&G, Mail Code BOC-022  
NASA Kennedy Space Center  
Kennedy Space Center, FL 32899

Dr. William B. Dye  
Medical Director  
Kelsey-Seybold, Mail Code AT01  
NASA Marshall Space Flight Center  
Huntsville, AL 35812

Mr. Arthur L. Culbertson  
Industrial Hygienist  
Boeing, Mail Code KA91-F676  
NASA Kennedy Space Center  
Kennedy Space Center, FL 32899

Ms. Joyce Eagan  
Program Analyst  
Mail Code ATO1  
NASA Marshall Space Flight Center  
Huntsville, AL 35812

Ms. Beverly Damewood  
Occupational Health Nurse  
Occu-Health, Mail Code 4810-B  
NASA Dryden Flight Research Center  
Edwards, CA 93523-0273

Mr. Emory A. Everhart  
Industrial Hygienist  
Boeing, Mail Code F676  
NASA Kennedy Space Center  
Kennedy Space Center, FL 32899

Ms. Mary Davidson  
EAP Manager  
Mail Code D-4810C  
NASA Dryden Flight Research Center  
Edwards, CA 93523-0273

Mr. Paul Fagiolo  
Director, Environmental Service  
Occu-Health, Inc.  
24 Frederick Road  
Ellicott City, MD 21043

Ms. Bette Davis  
Senior Industrial Hygienist  
Mail Code D-2152  
NASA Dryden Flight Research Center  
Edwards, CA 93523-0273

Dr. Emmett B. Ferguson, Jr.  
Manager, Occupational Health Program  
Support Office  
Bionetics Corporation, Mail Code BIO-5  
NASA Kennedy Space Center  
Kennedy Space Center, FL 32899

Ms. Catherine P. DiBiase  
Research/Flight Nurse  
Bionetics Corporation, Mail Code BIO-1  
NASA Kennedy Space Center  
Kennedy Space Center, FL 32899

Dr. Steven A. Field  
University of South Florida  
MDC Box 56  
13201 Bruce B. Downs Blvd.  
Tampa, FL 33612

Mr. Timothy L. Donohoe  
EAP Coordinator  
Johnson Controls World Services, Inc.  
Mail Code JCWS  
NASA Stennis Space Center  
Stennis Space Center, MS 39529

Ms. Susan Frahm  
Chief Nurse  
EG&G, Mail Code BOC-005  
NASA Kennedy Space Center  
Kennedy Space Center, FL 32899

Ms. Amy Douglass  
Health Education Coordinator  
Bionetics Corporation, Mail Code BIO-1  
NASA Kennedy Space Center  
Kennedy Space Center, FL 32899

Dr. M. Rony Francois  
Research Assistant Professor  
University of South Florida  
MDC Box 56  
13201 Bruce B. Downs Blvd.  
Tampa, FL 33612

Ms. Donna S. Freet  
Clinic Manager  
Zel Technologies, Mail Code 281  
NASA Langley Research Center  
Hampton, VA 23665-5225

Dr. Ron Z. Goetzel  
Vice President,  
The MedStat Group  
4401 Connecticut Avenue NW, Suite 400  
Washington, DC 20008

Ms. Ivonne Galceran-Garcia  
Flight Nurse  
Bionetics Corporation, Mail Code BIO-1  
NASA Kennedy Space Center  
Kennedy Space Center, FL 32899

Ms. Sheilla Goldberg  
Training Coordinator  
Kelsey-Seybold, Mail Code SD23  
NASA Johnson Space Center  
Houston, TX 77058

Dr. Brenda J. Geddis-Comrie  
Medical Director  
Hummer Associates, Mail Code 15-5,  
NASA Lewis Research Center  
21000 Brook Park Road  
Cleveland, OH 44135

Mr. Samuel G. Haddad  
Manager, Planning and Program Management  
Biomedical Office  
Mail Code JJ-4  
NASA Kennedy Space Center  
Kennedy Space Center, FL 32899

Mr. Alan G. Gettleman  
Program Analyst  
Occupational Health Program Office  
Mail Code JJ-H  
NASA Kennedy Space Center  
Kennedy Space Center, FL 32899

Dr. Thomas Hales  
NIOSH  
National Institutes of Health  
4676 Columbia Parkway, R-10  
Cincinnati, OH 45226-1988

Mr. Bart Geyer  
Industrial Hygienist  
EG&G, Mail Code BOC-022  
NASA Kennedy Space Center  
Kennedy Space Center, FL 32899

Ms. Susan Harper  
Group Supervisor  
Occu-Health, Inc., Mail Code 263  
NASA Jet Propulsion Laboratory  
4800 Oak Grove Drive, Bldg. 263  
Pasadena, CA 91109-8099

Ms. Diana M. Giammarco  
Industrial Hygienist  
Mail Code UO  
NASA Headquarters  
300 E Street, SW  
Washington, DC 20546

Mr. Robert P. Hessler  
Manager, Environmental Services  
Boeing, Mail Code KA-91-F676  
NASA Kennedy Space Center  
Kennedy Space Center, FL 32899

Mr. Steve Giebel  
Radiation Safety Officer  
Occu-Health, Inc.  
24 Frederick Road  
Ellicott City, MD 21403

Ms. Mary H. High  
Occupational Health Nurse  
EG&G, Mail Code BOC-005  
NASA Kennedy Space Center  
Kennedy Space Center, FL 32899

Ms. Miriam Glazer  
Health Programs Manager  
Mail Code DQH:218-1  
NASA Ames Research Center  
Moffett Field, CA 94035-1000

Mr. Lee Hinde  
HD Industries  
Mail Code DQH:218-1  
NASA Ames Research Center  
Moffett Field, CA 94035-1000

Ms. Ruth Hinkley  
Occupational Health Staff Nurse  
Occu-Health, Inc.  
24 Frederick Road  
Ellicott City, MD 21403

Mr. Jerry A. Jones  
Manager, Risk Management  
US Postal Service Headquarters  
Room 9801, 475 L'Enfant Plaza, SW  
Washington, DC 20260-4231

Dr. G. Wyckliffe Hoffler  
Conference Technical Coordinator  
Bionetics Corporation, Mail Code BIO-5  
NASA Kennedy Space Center  
Kennedy Space Center, FL 32899

Mr. Bruce C. Kelly  
Industrial Hygienist  
Bionetics Corporation, Mail Code BIO-5  
NASA Kennedy Space Center  
Kennedy Space Center, FL 32899

Mr. Patrick Hogan  
Safety Communications Manager  
Mail Code DQH:218-1  
NASA Ames Research Center  
Moffett Field, CA 94035-1000

Mr. Sean R. Keprta  
Occupational Health Officer  
Mail Code SD26  
NASA Johnson Space Center  
Houston, TX 77058

Mr. Steve Hulka  
Senior Industrial Hygienist  
Kelsey-Seybold, Mail Code SD23  
NASA Johnson Space Center  
Houston, TX 77058

Mr. David King  
Acting Chief, Safety, Health & Medical Services  
Mail Code DQH:218-1  
NASA Ames Research Center  
Moffett Field, CA 94035-1000

Dr. Paul V. Humbert  
Medical Director  
EG&G, Mail Code BOC-005  
NASA Kennedy Space Center  
Kennedy Space Center, FL 32899

Dr. Helene King  
President, COPE, Inc.  
1120 G Street NW, Suite 550  
Washington, DC 20005

Ms. Jerilyn S. Huneycutt  
Program Support Specialist  
Mail Code HM-A-3  
NASA Kennedy Space Center  
Kennedy Space Center, FL 32899

Ms. Mary K. Kirkland  
Supervisor, RehabWorks Program  
Bionetics Corporation, Mail Code BIO-1  
NASA Kennedy Space Center  
Kennedy Space Center, FL 32899

Dr. Fikry W. Isaac  
Director, Occupational Medicine  
Johnson & Johnson, Mail Code JH-120  
501 George Street, P.O. Box 16595  
Brunswick, NJ 08906-6595

Dr. Todd A. Kuhn  
Safety Engineer  
Dynamac Corporation, Mail Code DYN-1  
NASA Kennedy Space Center  
Kennedy Space Center, FL 32899

Ms. Luz Y. Jeziorowski  
Industrial Hygienist  
Mail Code 6-4  
NASA Lewis Research Center  
21000 Brook Park Road  
Cleveland, OH 44126

Ms. Wendy Large  
Fitness Director  
Hummer Associates, Mail Code 320-1,  
NASA Lewis Research Center  
21000 Brook Park Road  
Cleveland, OH 44135

Ms. Susan L. Lemons  
Vice President  
Quality Management and Engineering  
Johnson & Johnson, Mail Code GS1245  
410 George St.  
Brunswick, NJ 08901-2021

Mr. Jay Leung  
Senior Industrial Hygienist  
Occu-Health, Inc.  
24 Frederick Road  
Ellicott City, MD 21403

Ms. Karin L. Lewis  
Secretary, Conference Staff  
Bionetics Corporation, Mail Code BIO-5  
NASA Kennedy Space Center  
Kennedy Space Center, FL 32899

Ms. Sue L. Loffek  
Financial Analyst  
Dynamac Corporation, Mail Code DYN-1  
NASA Kennedy Space Center  
Kennedy Space Center, FL 32899

Dr. Irene D. Long  
Director, Biomedical Office  
Mail Code JJ  
NASA Kennedy Space Center  
Kennedy Space Center, FL 32899

Mr. George M. Marmaro  
Radiation Protection Officer  
Biomedical Office  
Mail Code JJ-C  
NASA Kennedy Space Center  
Kennedy Space Center, FL 32899

Mr. Robert K. Martin  
Environmental Health Services  
EG&G, Mail Code BOC-005  
NASA Kennedy Space Center  
Kennedy Space Center, FL 32899

Dr. Bruce D. Mather  
EAP Counseling Psychologist  
Mail Code CO10  
NASA Marshall Space Flight Center  
Huntsville, AL 35812

Ms. Antoinette C. Mayor  
Hazard Chemicals Specialist  
Mail Code 6-4  
NASA Lewis Research Center  
21000 Brook Park Road  
Cleveland, OH 44135

Ms. Ursula B. McCain  
Senior Industrial Hygienist  
Boeing, Mail Code F676  
NASA Kennedy Space Center  
Kennedy Space Center, FL 32899

Mr. Mark McCalman  
Safety Engineer  
Mail Code QA00  
NASA Stennis Space Center  
Stennis Space Center, MS 39529

Dr. Nancy McClure  
Medical Director/Program Manager  
Occu-Health, Inc.  
24 Frederick Road  
Ellicott City, MD 21403

Ms. Patricia McCullough  
President  
Occu-Health, Inc  
24 Frederick Road  
Ellicott City, MD 21403

Mr. William T. McGuire  
Administrator, EAP  
EG&G, Mail Code BOC-005  
NASA Kennedy Space Center  
Kennedy Space Center, FL 32899

Dr. David K. McKenas  
Director, Corporate Medical Department  
American Airlines  
Mail Code MD 5187  
4333 Amon Carter Blvd.  
Fort Worth, TX 76155

Dr. Lawrence J. McManus  
Director, Health Services  
Lockheed Martin, Mail Code 3085  
NASA Michoud Assembly Facility  
New Orleans, LA 70189

Ms. Jeannine A. Meister  
Occupational Health Nurse  
EG&G, Mail Code BOC-328  
NASA Kennedy Space Center  
Kennedy Space Center, FL 32899

Ms. Lauren Newcomer  
Corporate Operations Director  
Occu-Health, Inc.  
24 Frederick Road  
Ellicott City, MD 21043

Ms. Nancy Menzel  
Co-Director , OH Nursing Program  
University of South Florida  
MDC Box 22  
12901 Bruce B. Downs Blvd.  
Tampa, FL 33612

Mr. Rodney E. Nickell  
Supervisor, Health Physics  
EG&G, Mail Code BOC-022  
NASA Kennedy Space Center  
Kennedy Space Center, FL 32899

Dr. John E. Meyers  
Medical Director  
Kelsey-Sebold, Mail Code DQH:215-8  
NASA Ames Research Center  
Moffett Field, CA 94035-1000

Ms. Sherri M. Nickell  
Senior Industrial Hygienist  
United Space Alliance, Mail Code USK-N87  
8550 Astronaut Blvd.  
Cape Canaveral, FL 32920

Dr. James S. Moeller  
Medical Director  
Zel Technologies, Mail Code D-5152  
NASA Dryden Flight Research Center  
Edwards, CA 93523-0273

Dr. Arnauld E. T. Nicogossian  
Associate Administrator, Office of Life &  
Microgravity Sciences & Applications  
Mail Code U, NASA Headquarters  
300 E Street, SW  
Washington, DC 20546

Mr. Michael W. Moore  
Chief, Occupational Health  
Lockheed Martin, Mail Code 3733  
NASA Michoud Assembly Facility  
New Orleans, LA 70189

Mr. Greg R. Oblom  
Industrial Hygienist  
Boeing, Mail Code F676  
NASA Kennedy Space Center  
Kennedy Space Center, FL 32815

Mr. Jerry L. Moyer  
Project Manager  
Bionetics Corporation, Mail Code BIO-3  
NASA Kennedy Space Center  
Kennedy Space Center, FL 32899

Ms. Michele D. O'Donnell  
Technical Writer, Conference Coordinator  
Bionetics Corporation, Mail Code BIO-5  
NASA Kennedy Space Center  
Kennedy Space Center, FL 32899

Dr. Story Musgrave  
Astronaut  
8572 Sweetwater Trail  
Kissimmee, FL 34747

Ms. Theresa Owler  
Occupational Health Nurse  
EG&G, Mail Code BOC-005  
NASA Kennedy Space Center  
Kennedy Space Center, FL 32899

Mr. Erik T. Nason  
Athletic Trainer  
Bionetics Corporation, Mail Code BIO-1  
NASA Kennedy Space Center  
Kennedy Space Center, FL 32899

Dr. Peter T. Palmer  
Department of Chemistry & Biochemistry  
San Francisco State University  
1600 Holloway Avenue  
San Francisco, CA 94132-4163

Ms. Angela Pittman  
EAP Consultant  
COPE, Inc.  
1120 G Street NW, Suite 550  
Washington, DC 20005

Dr. Michael G. Rappa  
Occupational Health Program Support Office  
Bionetics Corporation, Mail Code BIO-5  
NASA Kennedy Space Center  
Kennedy Space Center, FL 32899

Ms. Jacqueline E. Reese  
EAP Director  
Mail Code SD242  
NASA Johnson Space Center  
Houston, TX 77058

Mr. Manuel Rodriguez  
Industrial Hygienist  
EG&G, Mail Code BOC-022  
NASA Kennedy Space Center  
Kennedy Space Center, FL 32815

Ms. Therease C. Ross  
Contracting Officer's Technical Representative  
Mail Code 500-314  
NASA Lewis Research Center  
21000 Brook Park Road  
Cleveland, OH 44135

Ms. Carol A. Roth  
Administrator, Health Education  
EG&G, Mail Code BOC-005  
NASA Kennedy Space Center  
Kennedy Space Center, FL 32899

Mr. Carl Ruf  
Manager, Environmental Services  
Occu-Health, Inc.  
24 Frederick Road  
Ellicott City, MD 21043

Ms. Theresa M. Rutherford  
Environmental Health Engineer  
EG&G, Mail Code BOC-022  
NASA Kennedy Space Center  
Kennedy Space Center, FL 32899

Dr. Philip J. Scarpa, Jr.  
Environmental Health Officer  
Biomedical Office  
Mail Code JJ-C  
NASA Kennedy Space Center  
Kennedy Space Center, FL 32899

Mr. Andre C. Schaefer  
Occupational Safety and Health  
United Space Alliance, Mail Code USR-142  
8550 Astronaut Blvd.  
Cape Canaveral, FL 32920

Ms. Diane C. Schultz  
Secretary, Conference Staff  
Occupational Health Program Office  
Mail Code JJ-H  
NASA Kennedy Space Center  
Kennedy Space Center, FL 32899

Mr. John D. Sherwood  
Environmental Health Engineer  
EG&G, Mail Code BOC-022  
NASA Kennedy Space Center  
Kennedy Space Center, FL 32899

Ms. Rebecca Siemens  
Industrial Hygienist  
Kelsey-Seybold, Mail Code SD23  
NASA Johnson Space Center  
Houston, TX 77058

Ms. Kathryn Sigurbjartsson  
Occupational Health Nurse  
EG&G, Mail Code BOC-228  
NASA Kennedy Space Center  
Kennedy Space Center, FL 32899

Mr. Pradeep Sinha  
Chief, Safety, Environmental and Security Office  
Mail Code 205  
NASA Goddard Space Flight Center  
Greenbelt, MD 20771

Ms. Claire Sleboda  
Chief Nurse, Occupational Health  
Mail Code D-4810B  
NASA Dryden Flight Research Center  
Edwards, CA 93523-0273

Dr. Charles Smallwood  
Deputy Medical Director  
EG&G, Mail Code BOC-005  
NASA Kennedy Space Center  
Kennedy Space Center, FL 32899

Ms. Patricia J. Smith-Araki  
Manager, Safety Operations Section  
Mail Code 190-112  
NASA Jet Propulsion Laboratory  
48009 Oak Grove Drive  
Pasadena, CA 91109

Ms. Dixie J. Stelling  
Secretary, Conference Staff  
Bionetics Corporation, Mail Code BIO-1  
NASA Kennedy Space Center  
Kennedy Space Center, FL 32899

Mr. Burton R. Summerfield  
Associate Director  
Biomedical Office  
Mail Code JJ-1  
NASA Kennedy Space Center  
Kennedy Space Center, FL 32815

Dr. Donal F. Sweeney  
Medical Director  
Occupational Health Services, Building 263  
NASA Jet Propulsion Laboratory  
48009 Oak Grove Drive  
Pasadena, CA 91109

Mr. Chris A. Symons  
Supervisor, Fitness Center  
Bionetics Corporation, Mail Code BIO-1  
NASA Kennedy Space Center  
Kennedy Space Center, FL 32899

Mr. James R. Taffer  
Supervisor, Industrial Hygiene Branch  
EG&G, Mail Code BOC-022  
NASA Kennedy Space Center  
Kennedy Space Center, FL 32899

Ms. Debora Taormina  
Chief Nurse, Occupational Health  
Kelsey-Seybold, Mail Code DQH:215-8  
NASA Ames Research Center  
Moffett Field, CA 94035-1000

Dr. Maurice A. Taquino  
Manager, Medical Director  
Johnson Controls World services, Inc.  
Mail Code JCWS  
NASA Stennis Space Center  
Stennis Space Center, MS 39529-6000

Dr. Christopher M. Teaf  
Center for Biomedical and Toxicological  
Research and Hazardous Waste Management  
Florida State University  
2035 E. Dirac Drive, Suite 226 HMB  
Tallahassee, FL 32310

Mr. David L. Thaxton  
Industrial Hygiene Officer  
Mail Code ATO1  
NASA Marshall Space Flight Center  
Huntsville, AL 35812

Mr. Wilson R. Timmons, Jr.  
Environmental Health Supervisor  
EG&G, Mail Code BOC-022  
NASA Kennedy Space Center  
Kennedy Space Center, FL 32899

Dr. David A. Tipton  
Chief, Medical and Environmental Health  
Program Office  
Mail Code JJ-C  
NASA Kennedy Space Center  
Kennedy Space Center, FL 32899

Ms. Pamela A. Tucker  
System Program Specialist  
EG&G, Mail Code BOC-022  
NASA Kennedy Space Center  
Kennedy Space Center, FL 32899

Ms. Susan S. Tzareff  
Environmental Health  
EG&G, Mail Code BOC-022  
NASA Kennedy Space Center  
Kennedy Space Center, FL 32899

Ms. Michelle Watterson  
Certified Adult Nurse Practitioner  
Hummer Associates, Mail Code 15-5  
NASA Lewis Research Center  
21000 Brook Park Road  
Cleveland, OH 44135

Dr. Robert L. Weston  
President, International Health Care  
International SOS Assistance, Inc.  
Eight Neshaminy Interplex, St. 207  
Trevose, PA 19053

Mr. Mark Weyland  
Project Manager  
Lockheed Martin, Mail Code C23  
NASA Johnson Space Center  
Houston, TX 77058

Mr. Peter A. Wickwire, Jr.  
Industrial Hygienist  
EG&G, Mail Code BOC-022  
NASA Kennedy Space Center  
Kennedy Space Center, FL 32899

Dr. Richard S. Williams  
Director, Aerospace Medicine  
Mail Code UO  
NASA Headquarters  
300 E Street SW  
Washington, DC 20546

Dr. Daniel Woodard  
Space Station and Special Projects  
Bionetics Corporation, Mail Code BIO-1  
NASA Kennedy Space Center  
Kennedy Space Center, FL 32899

Ms. Wanda Wrigfht-Trollinger  
Personnel Management Specialist  
Mail Code LA00  
NASA Stennis Space Center  
Stennis Space Center, MS 39529

Ms. Cherie Ziechang  
Occupational Health Manager  
Mail Code CP  
NASA Headquarters  
300 E Street, SW  
Washington, DC 20546

# REPORT DOCUMENTATION PAGE

Form Approved  
OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.

<b>1. AGENCY USE ONLY (Leave blank)</b> 26 February, 1999	<b>2. REPORT DATE</b> Final	<b>3. REPORT TYPE AND DATES COVERED</b> 24-28 Aug 98	
<b>4. TITLE AND SUBTITLE</b> Proceedings from the 1998 NASA Occupational Health Conference: Benchmarking for Excellence		<b>5. FUNDING NUMBERS</b> "C" NAS10-12180 "WU" 004-Y3	
<b>6. AUTHOR(S)</b> G. Wyckliffe Hoffler, MD and Michele D. O'Donnell, Editors		<b>8. PERFORMING ORGANIZATION REPORT NUMBER</b> NASA/CP-1999-208543	
<b>7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)</b> NASA Occupational Health Program Office NASA Biomedical Office NASA Kennedy Space Center, FL 32899		<b>10. SPONSORING / MONITORING AGENCY REPORT NUMBER</b>	
<b>9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)</b> National Aeronautics and Space Administration 300 E. Street, SW Washington, DC 20546		<b>11. SUPPLEMENTARY NOTES</b> Published as a NASA Conference Publication (CP)	
<b>12a. DISTRIBUTION / AVAILABILITY STATEMENT</b> Publicly available; Not copyrighted		<b>12b. DISTRIBUTION CODE</b>	
<b>13. ABSTRACT (Maximum 200 words)</b> Conference participants included NASA and contractor Occupational Health professionals, as well as speakers from NASA, other Federal agencies and private companies. Addressing the Conference theme, Benchmarking for Excellence, speakers described new concepts and techniques for corporate benchmarking. They also identified practices used by NASA, other Federal agencies, and by award winning programs in private industry. A two-part Professional Development Course on workplace toxicology and indoor air quality was conducted a day before the Conference. A program manager with the International Space Station Office provided an update on station activities and an expert delivered practical advice on both oral and written communications. A keynote address on the medical aspects of space walking by a retired NASA astronaut highlighted the Conference. Discipline breakout sessions, poster presentations, and a KSC tour complemented the Conference agenda.			
<b>14. SUBJECT TERMS</b> Occupational Health, Environmental Health, Occupational Medicine Benchmarking			<b>15. NUMBER OF PAGES</b>
<b>17. SECURITY CLASSIFICATION OF REPORT</b> Unclassified			<b>16. PRICE CODE</b>
<b>18. SECURITY CLASSIFICATION OF THIS PAGE</b> Unclassified	<b>19. SECURITY CLASSIFICATION OF ABSTRACT</b> Unclassified	<b>20. LIMITATION OF ABSTRACT</b> SAR	

## GENERAL INSTRUCTIONS FOR COMPLETING SF 298

The Report Documentation Page (RDP) is used in announcing and cataloging reports. It is important that this information be consistent with the rest of the report, particularly the cover and title page. Instructions for filling in each block of the form follow. It is important to *stay within the lines* to meet *optical scanning requirements*.

**Block 1. Agency Use Only (Leave blank).**

**Block 2. Report Date.** Full publication date including day, month, and year, if available (e.g. 1 Jan 88). Must cite at least the year.

**Block 3. Type of Report and Dates Covered.** State whether report is interim, final, etc. If applicable, enter inclusive report dates (e.g. 10 Jun 87 - 30 Jun 88).

**Block 4. Title and Subtitle.** A title is taken from the part of the report that provides the most meaningful and complete information. When a report is prepared in more than one volume, repeat the primary title, add volume number, and include subtitle for the specific volume. On classified documents enter the title classification in parentheses.

**Block 5. Funding Numbers.** To include contract and grant numbers; may include program element number(s), project number(s), task number(s), and work unit number(s). Use the following labels:

<b>C</b> - Contract	<b>PR</b> - Project
<b>G</b> - Grant	<b>TA</b> - Task
<b>PE</b> - Program Element	<b>WU</b> - Work Unit Accession No.

**Block 6. Author(s).** Name(s) of person(s) responsible for writing the report, performing the research, or credited with the content of the report. If editor or compiler, this should follow the name(s).

**Block 7. Performing Organization Name(s) and Address(es).** Self-explanatory.

**Block 8. Performing Organization Report Number.** Enter the unique alphanumeric report number(s) assigned by the organization performing the report.

**Block 9. Sponsoring/Monitoring Agency Name(s) and Address(es).** Self-explanatory.

**Block 10. Sponsoring/Monitoring Agency Report Number.** (If known)

**Block 11. Supplementary Notes.** Enter information not included elsewhere such as: Prepared in cooperation with...; Trans. of...; To be published in.... When a report is revised, include a statement whether the new report supersedes or supplements the older report.

**Block 12a. Distribution/Availability Statement.** Denotes public availability or limitations. Cite any availability to the public. Enter additional limitations or special markings in all capitals (e.g. NOFORN, REL, ITAR).

**DOD** - See DoDD 5230.24, "Distribution Statements on Technical Documents."

**DOE** - See authorities.

**NASA** - See Handbook NHB 2200.2.

**NTIS** - Leave blank.

**Block 12b. Distribution Code.**

**DOD** - Leave blank.

**DOE** - Enter DOE distribution categories from the Standard Distribution for Unclassified Scientific and Technical Reports.

**NASA** - Leave blank.

**NTIS** - Leave blank.

**Block 13. Abstract.** Include a brief (*Maximum 200 words*) factual summary of the most significant information contained in the report.

**Block 14. Subject Terms.** Keywords or phrases identifying major subjects in the report.

**Block 15. Number of Pages.** Enter the total number of pages.

**Block 16. Price Code.** Enter appropriate price code (*NTIS only*).

**Blocks 17. - 19. Security Classifications.** Self-explanatory. Enter U.S. Security Classification in accordance with U.S. Security Regulations (i.e., UNCLASSIFIED). If form contains classified information, stamp classification on the top and bottom of the page.

**Block 20. Limitation of Abstract.** This block must be completed to assign a limitation to the abstract. Enter either UL (unlimited) or SAR (same as report). An entry in this block is necessary if the abstract is to be limited. If blank, the abstract is assumed to be unlimited.